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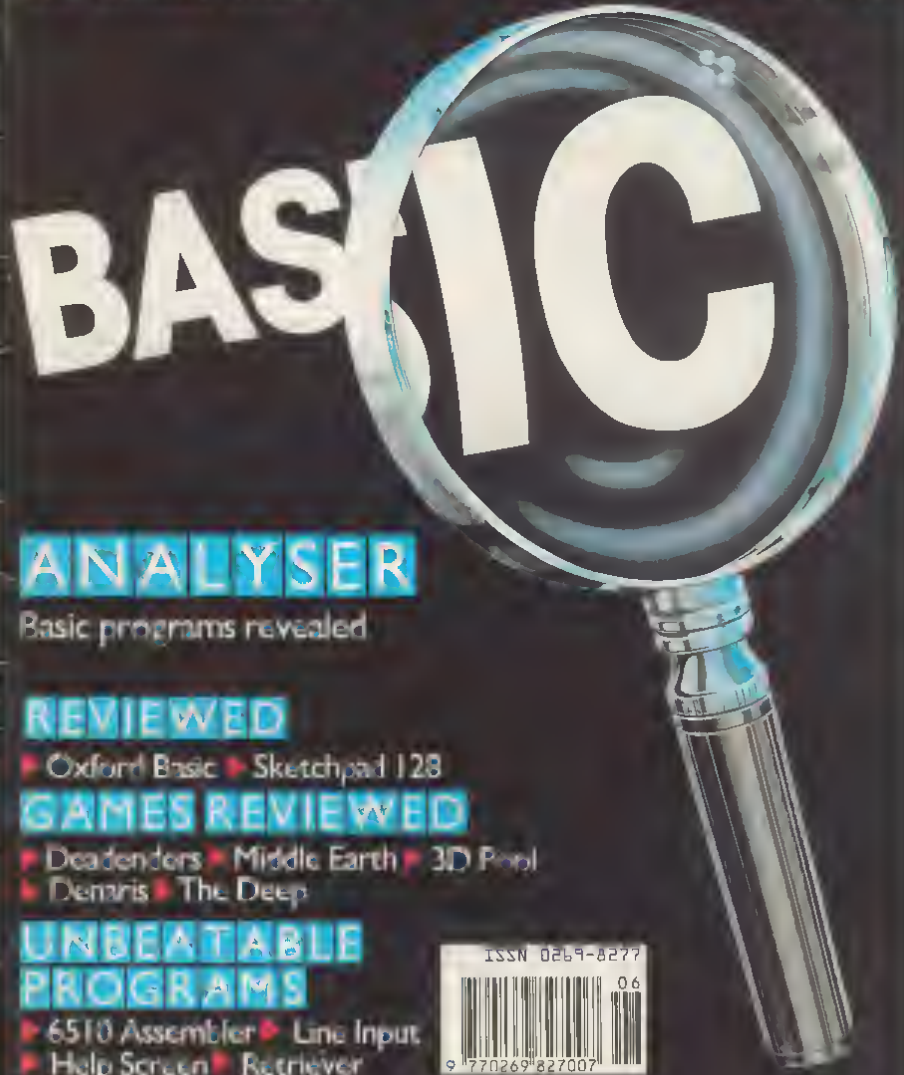

ANALYSER

Basic programs revealed

REVIEWED

- Oxford Basic
- Sketchpad 128

GAMES REVIEWED

- Deadenders
- Middle Earth
- 3D Pool
- Denaris
- The Deep

UNBEATABLE PROGRAMS

- 6510 Assembler
- Line Input
- Help Screen
- Retriever

ISSN 0269-8277

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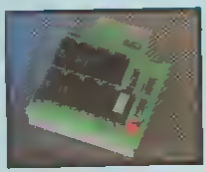
DATEL ELECTRONICS



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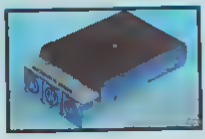

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- No need to buy parallel cards if you have Disk Demon/Dolphin etc
- Cable has throughbus extension for other add ons

Wether to choose FastHack'em or Burst Nibbler? Fast Hack'em is obtainable value as an "all rounder" with nibbler (or 2 drive copy format file copy 1571 copy etc etc) so if you have a more general requirement perhaps Fast Hack'em is for you. Burst Nibbler is a pure nibbler second to none for the reasons stated. So if it's just loading backups you are interested in there is no other product to beat it!

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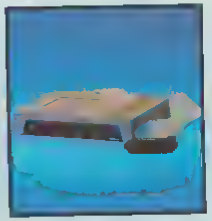
CABLE ONLY £14.99



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- Software features test mode/ analogue oscilliscope/voice activate/digital readout etc.

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INCLUDING HARDWARE/SOFTWARE/ MIDI ETC.(STATE TAPE OR DISK).

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THE ULTIMATE DISK TOOLKIT FOR THE 1540/1541.

- A disk toolkit is an absolute must for the serious disk hacker Toolkit IV has more features than most for most.
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- DISK LOOK Sort directory Recover lost files Display file start /end addresses Disassemble any file program directly from the disk to SCREEN or PRINTER including undocumented opcodes Edit name
- FAST FILE COPY Inspection file copy Works at up to 6 times normal speed.
- FAST DISK COPY Copy an entire disk in 2 minutes or less using single 1541
- FILE COMPACTOR Can compact machine programs by up to 50% Save disk space. Compressed programs run as normal.
- FORMATTER 10 second format on entire disk or format any individual track or half tracks 0 to 42 Re-define any of 20 parameters to create or recreate unique disk formats.
- ERROR EDIT Quickly find & recreate all read errors including extras & re-numbered blocks in sectors & half tracks Read 0 to 42 then recreate data under mouse & allows you to redefine any necessary parameters

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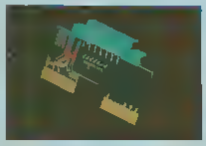

NEW CLONEMASTER

- The most effective tape to tape back up board available
- Makes perfect backups of your tapes easily & effectively!!
- No user knowledge needed at all
- On board TTL logic circuitry actually shapes the program & sends a perfect signal to the record cassette - producing a copy better than the original in many cases
- L.E.D indicator shows when data is being transferred to avoid massive tape winding
- Works with almost any program including multi loaders turbos & even very unusual type turbos
- Requires access to two CBM compatible data recorders.
- Simply press 'Play' on one recorder & press 'Record' on the other that's it!
- You can even make a backup while you are loading the program
- This is a total software solution as programs to load the results are stunning!

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TURBO ROM II IS A REPLACEMENT FOR THE ACTUAL KERNAL INSIDE YOUR 64. IT PROVIDES SUPERFAST LOAD/SAVE ROUTINES

- Loads most programs at 5-6 times normal speed
- Saves at 5-6 times normal speed as well
- Improved DOS support including 10 sec. format
- Programmed function keys - load directory old etc
- Returns to normal Kernal at a flick of a switch
- FCOPY 250 Mock file copier
- FLOAD-special I/O loader
- Plus lots more
- Fitted in minutes - no soldering usually required. (On some 64's the old ROM may have to be desoldered)

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SMART CART

- 32K pseudo ROM.
- Lithium battery lasts up to 5 years
- Simply load the program you require then flick the switch. The cartridge now then be removed just like a ROM cartridge
- Make your own cartridges including autostart types - without EPROM burner. 32K voltage + 4 x 8K pages.
- Some knowledge of M/C is helpful but full instructions included
- I/O 2 slot open for special programming techniques

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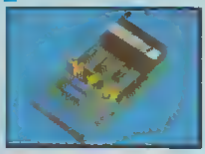

EPROMMER 64

- A top quality easy to use EPROM programmer for the 64/128
- Fully menu driven software/hardware package makes programming/reading/verifying/copying EPROMs simplicity itself
- Will program 2716 2764 27128 & 27256 chips. 12.5 21 or 25 volts
- Fits into user port for maximum compatibility with cartridges/Superom Board etc
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- We believe Eprommer 64 is the most comprehensive most friendly & best value for money programmer available for the 64/128
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- Comes complete with instructions plus the cartridge handbook

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RAM DISK

- Turns your Smart Cart into a 32K Ram/disk.
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BLAZING PADDLES

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  - Airbrush
  - Rectangle
  - Circle
  - Rubberbanding
  - Lines
  - Freehand
  - Zoom mode
  - Printer dump
  - Load/save
  - Advanced colour mixing over 200 hues!
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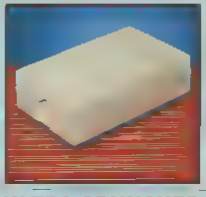

BLUE CHIP DRIVE

- External power supply for cool operation
- Drive works to 1571 double sided mode (128 mode)
- Fully C64/128 compatible.
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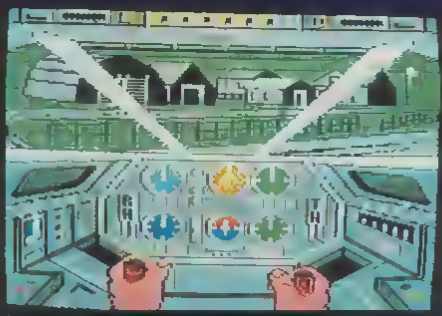
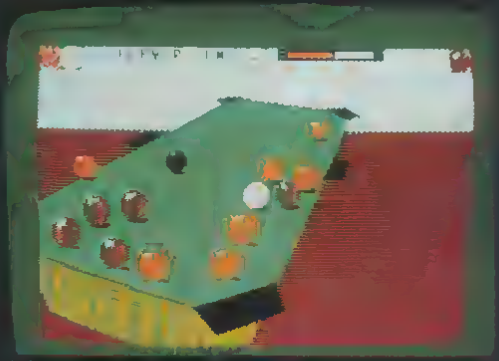
NUMBER 9

Super Cycle



Infiltrator



3D Pool

FEATURES

REGULARS

PROGRAMS

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ABC

Free The Spirit

If there's one company above all the others that's trying to make your C128 more like an Amiga it's Free Spirit Software This American company seems determined to produce good, high-quality graphics packages for the C128 Their latest offering is Poster Maker 128, with which you can create posters ranging in size up to 25 pages You need 80 col display and a C128D or C128 with the 64K video Ram upgrade You can import Basic 8, Sketchpad 128 or Spectrum 128 files There is also an option for reducing, thereby enabling you to perform clip art

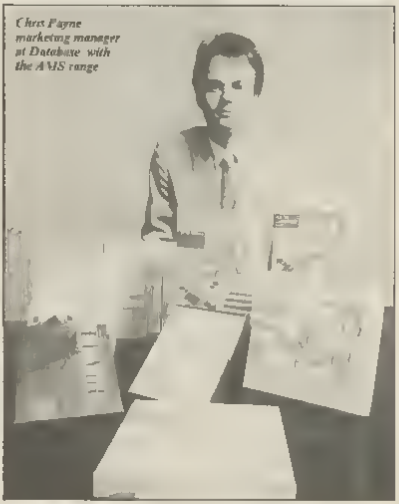
***Touchline.** Free Spirit Software PO Box 128, 58 Noble St Kutztown PA 19530 Tel 215 683 5609*

Spirit of Adventure

Good news for Adventurers After much public pressure Incentive Software has rewritten the classic Graphic Adventure Creator The new release will allow Stand alone disk accessed adventures to be produced This will mean that you can now create adventures of incredible size and complexity restricted only by disk size The release date for this exciting product is April 10th It will retail at £29 95, but existing GAC holders may upgrade for a mere £10 00

***Touchline** Incentive Software Ltd Zephyr One Calleva Park Aldermaston, Berks RG7 4QW Tel 07356 77288*

Data Statements



Chris Payne marketing manager at Database with the AMS range

Stop Press!

Database Software have just acquired the rights to two well established DTP packages for the C64 and C128 Both titles originate from AMS The titles are Stop Press, and Stop Press with mouse costing £39 99 and £69 99 respectively Productivity software is a little thin on the ground for the 64 128 so well done Database

***Touchline** Database Software Europa House, Adlington Park, Adlington Macclesfield, SK10 4NP Tel. 0625 878888*

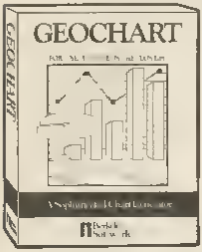
Viva Geos

There is no quicker or easier way to present data than with a graph or chart, and GeoChart is a simple and inexpensive way to produce good-looking graphs and charts etc etc' or so the blurb goes Berkley Softworks have added yet another program to their ever growing army of Geos utilities GeoChart is ideal for anyone that wants professional-looking documents and charts but can't spare the time needed to plan and draw graphic illustrations

Like all the Geos appli-

cations GeoChart is the 'What you see is what you get' format That is, pull down menus, windows and icons GeoChart is for the C64 and C128 owners

Touchline Berkley Softworks 2150 Shattuck Avenue Berkley California 94704 Tel 415 644 0883



Hubba Hubba!

Electronic Arts have enhanced that popular game from Bullfrog, *Populous*, by adding a new sound track from Rob Hubbard

Rob who left the UK in '88 to work in sunny California has since been working on a major project The work involves creating a code package that will allow real soundtracks to be produced The driver, we are told, will be usable over and over again for any product that requires a soundtrack

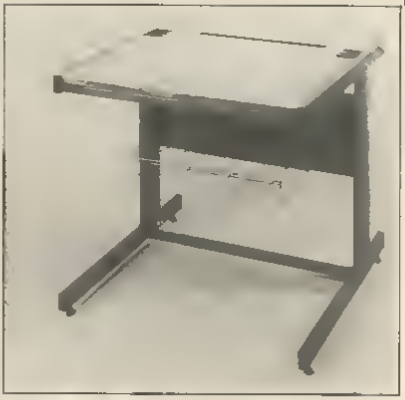
Touchline Electronic Arts, Langley Business Centre 11/49 Station Road, Langley Berkshire, SL3 8YN Tel 0753 49442

Rob Hubbard – artist in exile

Watch Out

Microprose are about to launch an attack on your senses with *Navy Seal*, a 64 game packed with action You are a member of the Elite US Navy force, the sea-air-land commandos, who are experts in sabotage demolition, reconnaissance and infiltration So that you don't miss the boat a *Navy Seal* Digital Watch (Right) will be given away with every copy purchased The release date should be in early April at an expected cost of £12 95 on disk.

Touchline Microprose, 2 Market place Tetbury Glos GL8 8DA Tel 0665 54326



Make a Stand

Have you noticed how computer furniture never gets a mention? Well, here goes From MDS of Hemel Hempstead comes the MDPS 750 printer stand Of all the peripherals, printers seem to cause the most positional headaches, but this new stand could solve all your problems (although the £204 price tag may put you off) It is, and I quote "uniquely designed to achieve maximum efficiency and part of a comprehensive modular desk system which measures 750mm wide 710mm high and 750mm deep, has an 18 inch cut-out in the top, making the unit suitable for both top and bottom feed printers" The other good point is the electronic cable management system incorporated into this unit no more wires and cables need get in the way

Touchline MDS Industries (UK) Ltd Factory 1 Ebberns road Hemel Hempstead, HP3 9QS Tel. 0442 231305

Change At Waterloo

Persons of Restricted Growth everywhere here's your chance to get your own back! The latest offering from SSI available via US Gold allows you to assume the persona of Shorts' Bonaparte and change the course of history Called *Battles of Napoleon a construction set* this program allows you to either right authentic Napoleonic wars, or simply create your own We are assured that these battles are realistically recreated in every detail, with cavalry charges bombardments, skirmishes and formations Priced at £24 99 for the C64, the game offers good value

Touchline *U S Gold, Units 2/3 Holford Way Holford Birmingham B6 7AX Tel 021 356 3388*

Special Relationship

News has reached us of a bilateral deal between Krisalis and Action Ware the outcome of which should prove beneficial to all you game players The deal means that Krisalis will market AW software here in the U K and AW will market theirs over there The first product off the press was *Prison*, which was released on March 10th for the Atari ST and Amiga

The Hammy Hamsters

Fame and fortune can make people do weird and wonderful things Howard Hughes became a recluse a certain Mr Kiam bought a razor factory, and Mr Wyman managed every man's dream Now it's the turn of the Darling family Not content with producing both passable budget software, they have recently broken out into song To help promote their latest release, *Rock Star*, they've formed a group which, for reasons best known to themselves, is called The Hamsters Judging by the picture I know which Hamster I'd like as a pet!

Touchline *Code Masters Software Co Ltd Lower Farm House, Stonethorpe Southam Warwks CV33 0DL Tel 0926 814132*

Amiga Airlines

Buyers of Commodore's new 'Amiga Air Miles Pack' will be receiving free air miles along with their machines The package offers an Amiga 500, a TV modulator, three new games (*Roger Rabbit Nebulus* and *StarRay*), comprehensive paint packages and 500 free air miles all for £499 99 The offer will give Commodore customers the chance to book return flights to a number of European cities including Paris and Amsterdam All flight vouchers will be valid until March 1990, and can be easily redeemed via the special Commodore Air Miles Hotline as well as local travel agents

Touchline *Commodore Business Machines (UK) Ltd, Commodore House The Switchback Gardner Road, Maidenhead Berks SL6 7Y4 Tel (0628) 71456*

Hit The Jackpot At The Commodore Show!

Commodore are giving away £500 worth of computer equipment to the Amiga user with the most innovative and unusual use for his machine A nation wide search has been launched to discover as many weird and wonderful applications for the Amiga as possible, and entrants will be judged by a panel of experts at the Commodore Computer Show, which opens at the Novotel Hammersmith on June 2

The show itself has been revamped by Database Exhibitions, and will now include seminars on making music graphics Commodore magazines (including of course *YC*) and game writing 'Beat The Author' competitions are also planned, in which punters will be able to take on 'named' authors and try to beat them at their own game But one of the big highlights of the show will undoubtedly be the innovation competition

Commodore has already discovered a wide variety of uses for the Amiga, from bird-watching to betting on horses and has even heard of one user who works out menus for reptiles on his machine! If you think you can match these innovative applications, all you need to do is write a brief description no more than 500 words and send it in, along with any necessary support material on disk, to

The Editor,
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Entries should reach us before May 31st

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Commodore Graphics Centronics **£185 95**
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Your chance to air your views in Your Commodore

I have just received a Commodore PET 3032 Computer from a friend. With it was a 8050 Disk Drive and 4022(P) Printer. I was wondering if you or any of your readers had any information on software availability. Please send any information to me. thank you.
R.M. Crook, 29 Grange Road, Bromley Cross, Bolton, BL7 9AU

I was recently given a PET 8032, a 8050 Dual Drive and a 4023 Printer together with four good software packages complete with manuals and dongles, where necessary. I only want to use the PET for wordprocessing, and so I am sending out an appeal. Is there anyone out there that has a program for the 8032 that they don't want? If so, please contact me at my address. Thank you.
J. Simpson, 4 Goldenstones Avenue, Dunbar, East Lothian

Come on now everyone, we know these are pretty ancient machines but there must be someone out there who can help!

Dear YC
Is there anything that can be done with old printer ribbons? I feel that it's a great waste to throw them away.

Could one possibly revitalise them with ink in some way? If so, which ink should be used or can I send them somewhere to be done?
J. Osborn, Luton, Beds

Our reply
The answer John is yes. Printer ribbons can be re-inked. If you get a copy of Micro Computer Mart, *you will find a firm advertising this service every week.*

Dear YC
With three CDU disks, I have had some loading problems. The fault lies not with yourselves but rather with the newsagents, when they stack magazines on top of each other. I have found that 'Validating' the disk beforehand seems to cure this problem.

I don't know what proportion of failures are returned but this Tip may help in some way.
J.F. Paddock Wood, Tonbridge, Kent

Our reply
Thanks for this helpful little tip. We do get some returned disks and many of them are cured by this simple method.

Unfortunately news agents and booksellers do not realise how delicate disks are.

Dear YC
I have been computing ever since the Commodore 64 was first produced. In this time I have bought various computer magazines, mostly multi-format, and I've noticed various discrepancies between reviews of the same game. For instance, Tetris received 50 out of 100 from one, but 97.5 from another.

The trouble with two completely different results is which one do I believe? Do I take the advice of magazine A and stay clear of it, or do I take B's advice and sell my TV so that I can buy it?

The best advice for anyone is to try and get into the reviewer's mind. Some reviewers set their hopes too high, and so if a game doesn't come up to their expectations, they give it a poor write up.

A recent review of *Thunderblade* is a good example of this. One reviewer of this game said: "The graphics at this point, Level 1 stage 1, were very disappointing – the buildings are just stacked squares."

Personally, I think the graphics are very good. Okay, the first stage on each level is blocky, but you can't really expect hi-res graphics can you? It would be much too slow. Anyway, you've always got stages 2 and 3 in each level to make up for it.

Another annoying item is 'Moaning'. You know the kind of thing: "The Q button doesn't work, so you have to use the F7 key". A great example of this can be found in the same review of *Thunderblade*. The reviewer said 'Unfortunately, it is hard to find any difference between cannon and air-to-ground rockets.' There are two possible reasons for this – (A) His/Her cassette deck/disk drive was faulty or (B) their copy of the game was faulty. These are the only possibilities, as my copy of the game is the opposite.

In conclusion then, what do you do if two reviews differ? The first option is to see if you can have a demonstration of the program, therefore allowing you to make up your own mind. The second option is to simply take a chance.
N. Kingsley, Chichester, West Sussex

Our reply
Thanks for such a long and critical' letter. However, I think you're missing the point (as do a lot of people). Reviewers of software do not differ from any other form of reviewer be it Films, Videos, Records, Food, Clothes Etc. Etc.

The whole point here is this – the comments passed are the comments of that particular person, NOT the comments of a professional critic' For example, I personally have never liked Elite, *but for 1.5 million other users it is the best program ever.*

Likewise for me Infocom are the only people that produce decent adventures, but I bet thousands of people would not agree. Basically, one must remember that a reviewer's comments are his own personal comments. A review only really tells you what the objective is and how the game plays. There is only one person that can say whether it is good or bad, and that is you.

MIXING Business WITH LEISURE WILL BE A REAL EDUCATION

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June 2 to 4
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Business

Many companies will be demonstrating their latest software and hardware specially designed to release the full business potential of Commodore computers.

As well as products for the C64 and Amiga series you'll be able to try out applications for the price-beating Commodore PC compatible micros.

And you'll also be able to attend seminars covering all aspects of using Commodore micros in your business.

Leisure

The C64 and Amiga computers are the most powerful 8 and 16 bit micros for producing fast action arcade quality games. The range of new software on show will demonstrate how these machines' power is constantly being stretched producing faster and even more addictive games with superb graphics.

If you're a keen game player you'll find there's so much on offer at the show you're guaranteed a real treat!

Education

Commodore micros are now used as educational tools all over the country. With the development of BBC Basic on the Amiga and the advent of Desktop Video (combining TV pictures with text and graphics) the range of educational applications is endless.

At the show you'll see how the latest software packages are making real breakthroughs in the educational sector and be able to try them out for yourself.

Special Events

As well as special events and presentations you'll also be able to meet some of your favourite celebrities and maybe get a chance to talk with them about how they use micros in their work.

So for a great day out whether you want to see what the future holds for Commodore computers to buy the latest software or to get advice on specific applications the Commodore show is the place to go. And if you send in the coupon today we'll knock £1 off the price of each ticket!

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First Steps

How to make sense of Listings **By Norman Doyle**

Typing listings in can be much more of a trauma than it need be. At *Your Commodore*, we are aware that sometimes the process seems difficult or even nonsensical. Our Listings with their Syntax Checker and special codings may ease the way but sometimes more support is required.

Many programs are listed in several parts and each part uses the same line numbers. How is this possible and how do you set about typing them in?

First of all it should be explained that a set of these programs form a suite which operate in unison. The way to use them is to type in the first program and save it. Now the computer should be cleared by entering NEW or even by switching the computer off and on.

Proceeding to the second listing, the program is again typed in and saved. If you're storing the programs on tape you should ensure that this program is saved immediately after the first one. For disk users, it doesn't matter where it's saved as long as it's on the same disk as the first program. After checking that all has been saved safely, the machine is again refreshed using NEW or the power switch.

Any subsequent programs should be treated in the same way as the second listing and the result will be a string of programs. One word of caution which should be heeded is that the programs should be saved under the name given in *Your Commodore* because each program occasionally uses one of these names to load in the next program in the string.

Suite Confusion

One question which we're often asked is why these multipart programs are needed. The answer is that they are a memory-saving or time-saving measure.

Many programs use redefined characters, machine code patches and sprites. The information for this has to be poked into position because they rarely occupy memory locations which Basic uses. This difficulty can be overcome in either of two ways.

The data can be poked into position each time the program is loaded and forms an integral part of the program. This has the dual disadvantage of the time the program takes to move the data in but, more importantly, reduces the amount of space for the master program itself.

Another way of achieving the same result is to use a series of set-up programs before the main program is loaded. The set-ups are loaded and run in turn and each one pokes information into memory where it cannot be touched by any subsequent loading actions. Consequently, once the progeam has done its job it is no longer needed and the program can even be removed by typing in NEW without ruining the effect of the main program when it is eventually loaded.

One thing that you cannot do is to switch the computer off and on again! This action totally clears the memory, including the data which has been poked in.

When the first program has done its job, the next program is loaded normally and run. Now there are two

blocks of data locked away safely This continues until the final program is loaded This is the main program which holds the key to unlocking and using the data which the previous programs positioned The fact that each of the programs may have contained the same line numbers is totally irrelevant because it's what each program does and not how it does it It's a little like receiving a birthday card and an electricity bill they both carry the same address but the effect they have on the mind is totally different!

Gift Boxes

Although this system solves the problem of memory space, it does not save time and a long program can seem to take forever to poke the data into position One way to overcome this is to create a program which not only pokes the data into position, but also saves the pure data block afterwards

These *throwaway* programs or Basic loaders to give them their correct name, are quite common and need treating separately The process can be quite complicated so we'll take the case of a single program first

As usual, the program is typed in and saved before running it Next a new tape or disk should be placed in the storage device Now when the program runs it will save the data back onto the new tape but in a different form The new program will be loaded directly into memory without the need for a Basic program to poke it there These programs usually have to be started with a SYS command and once checked, the program that was originally typed in can be forgotten and erased

The Basic program is rather like a gift box which becomes useless once the contents have been removed

A program of this kind which is separated into parts is immediately recognisable because the master program is the first in the chain If this is in Basic it should be typed in and saved If it is a Basic loader it must be treated differently

Spot The Loader

A Basic loader can be recognised by the reams of DATA statements which must be typed in Another indicator is the shortness of the actual program, excluding the DATA statements, which often only contains a FOR NEXT loop separated by complex POKE commands

If the main program proves to be a Basic loader it should be typed in and saved but when it is run a separate disk or tape should be already in the save device

After dealing with the main program, any subsequent parts should be typed in and this version saved to the first tape or disk On running, the resultant program should be saved on the second tape immediately after the preceeding part

Basically, the rule to remember is that any programs which have duplicated line numbers cannot reside in memory at the same time They should be typed in and saved separately according to the instructions given in the relevant *Your Commodore* article or the REM statements in the listings themselves Stick to this rule and you'll never go wrong well rarely!

The Case of the Electronic Home

Leaving aside his relentless search for the dreaded Moriarty, Mr Sherlock Holmes and his old friend Dr Watson visit the Ideal Homes exhibition and discover that 221B Baker Street is not all that it should be...

By Gordon Hamlett

'Holmes I've got a letter here from a distraught magazine editor asking us to investigate the future of the electronic house but I don't know how to go about the job' 'Well Watson you can always pop down to the furniture exhibition at Earl's Court and see what's new' 'That's Ideal Holmes!' (*Oh God Ed*)

So it was that our two intrepid detectives went off in search of clues as to how long it would be before everything in the house could be operated at the flick of a switch

When they arrived at the show though they were in for something of a surprise Whereas even a couple of years before, every machine was being heavily promoted as the all singing, all dancing model with more lights and buttons than you knew what to do with this year's displays were much more minimalist in design It was as if it was assumed that the machine could do everything that was asked of it, and it was simply left at that

'There are two distinct problems here' said Holmes 'To start with, you will notice that just about every machine, from cameras to washing machines has chips in it, which in turn gives the end user access to a plethora of functions But although the customer may appreciate having all these extra facilities, he doesn't actually use many of them After all, just about every single compact disc player lets you program the tracks in any order that you want. But who in their right mind is going to mess about with the order of the movements in a Mozart symphony?'

'The second problem is that nothing is compatible unless you stick to just one manufacturer So the customer ends up with separate remote control handsets for his television, video and hi-fi None of them will turn on his dishwasher, and he can only use them over a limited range What is needed is some all-powerful control system

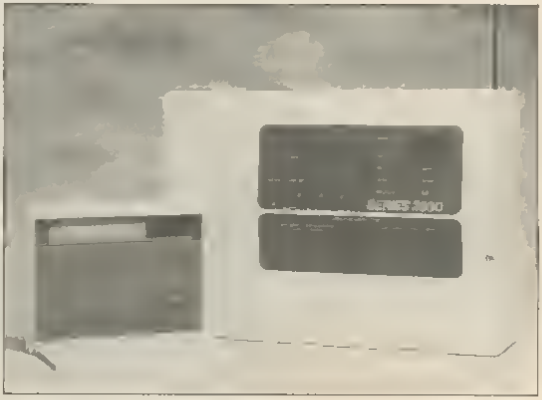
'I notice that all the display houses have a study' commented Watson 'The idea of people working more and more from home persists even though there is little evidence to suggest that it is actually happening It seems that computers are still regarded as toys unless they possess those three magic letters IBM Modems still have not caught on as they have done in America Instead, no home should be without its own personal fax machine'

'If we are not very careful Watson, you and I could soon be out of a job The one major area of expansion in the electronic field is in security systems I see that Modern Alarms are offering a wire free programmable system easy to install, no messing up the decoration and it can be taken

with you when you move And every type of alarm imaginable is here magnetic contacts heat radar, sound vibration, breaking glass, infra red beams and close circuit wiring There are even personal alarm buttons '

'How is the enterprising burglar supposed to get past that little lot, and if there are no criminals then what are we to do? Ah here is something that would fool even me A machine that emits artificial barking noises Remember that case of the dog that didn't bark in the night?' This device would have totally messed up that story

'I can find no trace of robotics here Holmes It looks as if we will have to put up with Mrs Hudson's housekeeping for at least another year This is one field that has definitely not progressed as quickly as everybody anticipated, although I still hear rumours that two of the biggest fast food chains are battling to be the first



to get their customers served by automatons'

At last Watson, I think that we have found what we were looking for. A system that will control every domestic appliance in the house and which can be operated either from the central processing unit from a handset or, more importantly, via a telephone link. Just think of it. Being able to phone home if we are out on a case and instruct the video to record *Crimewatch* and *Police 5*.'

'I see that the system – Credanet from Creda – works by means of a series of transceivers placed in every appliance. It then communicates with the central processing unit using existing mains circuitry. This c p u has a large display panel as well, so that you keep addresses and diary dates as well as being able to check up on share prices and train times. That would have been useful in the Baskerville case.'

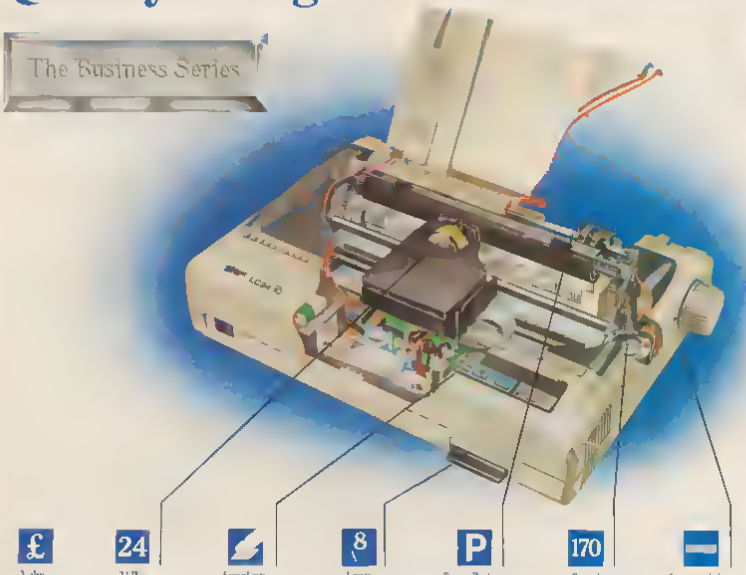
We would be able to control the temperature in every room in the house, varying it as and when we saw fit. Lighting could be similarly controlled, ranging from individual lamps upwards. Imagine being able to turn out the kitchen light from your bed when you had forgotten to do so. All your aforementioned security devices could be checked easily, although it would lessen the impact of my detective powers if I knew beforehand exactly who had turned up at my front door.'

'Turning on the cooker, doing the washing in the middle of the night and arranging for records of my beloved violin music to start playing as soon as I walked through the door. And all available in the next couple of years for about a thousand pounds.'

This has got to be the way forward eh Watson? This is where the future of the electronic house lies. It doesn't matter what make of appliances you've got – they can all be controlled from the one system. I would guess that we will be hearing of many more such control systems in the next few years, each offering more and more features and with the price coming down all the time.

'There's only one thing left for us to investigate now Watson, and that is to find out what is on the other side of that yellow door.' 'What's so special about the yellow door Holmes?' 'It's a lemon entry my dear Watson!' (*Have mercy, Hamlet, no more please* – a distraught Ed)

Quality. Designed from the inside out.



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Returner

Return to the menu at any time with this ingenious program

The problem of keeping records of what's on your disk was addressed in *Commodore Disk User* Vol 1, No 2 (Jan/Feb 88) by Menu Maker. This useful utility allowed you to load any program direct from the Menu, but to return to MENU you had to add the load statement to each program on the file which is easy enough to do, but usually means putting check questions in and having to end the running up of the program. You could also do it by pressing Run Stop and reloading "Menu", but that's rather a waste of time.

The program Returner allows you to leave a program at any point or time, and return to the menu to select an alternative program without all the problems outlined above.

On loading and activating the 'RETURNER' program code the first job that it does is to set up the 'RESTORE' key and automatically load a MENU.

Obviously, for the program to work correctly you must have a 'MENU' program on your disk. We have published quite a few such programs in the past. Alternatively, you could write one of your own. To get the best results, it is advisable to have at least two, if not more, progcams on your menu.

Once you have your menu program running, yu select which program you want as normal. On running the selected program, you can press the 'RESTORE' key at any time to return to your MENU program.

If the returner won't work

There are two reasons why Returner may not work.

1. The program m memory is using the NMI interrupt, or it is restoring the interrupt vectors to normal values. You need to alter your program (if possible) so that it's not using the NMI interrupt.

   N.B. The NMI interrupt values are located at 792-793 ($318-$319).
2. The memory location where 'Returner' is located is being used by the program being run. See solution below.

Program checker

This program will provide you with alternative memory locations to hold the 'Returner' program. Load 'CHECKER",8 & run. This will give the following instructions on screen:

First Type in N
Then Load Menu, Load A File, & Reset
Load Menu, Load Another File, Reset
Repeat Until all Files Loaded
Load Checker & Type Y
Have You Wiped Before?

When running 'Checker' will show a blank screen until processing is complete. This will take approximately three minutes and then show on the screen:

Ready.
Load "Menu",8

Press Return. Run the menu, then load first file, then reset computer by pressing RUNSTOP & RESTORE (or by using a Reset cartridge) **Do not switch the computer off & on.**

Reload the menu, run the next program, then reset as before and continue until all files have been loaded. Once all the programs on the disk have been run, reload CHECKER, run, and type in Y to the question.

Option is given to output to printer as well as screen. The result of the program is a list of free memory positions available for insertion of the program Returner. You can select the desired position to place Returner (if no space available it will tell you so the Returner cannot be accommodated on that disk.)

To change the position of returner in memory:

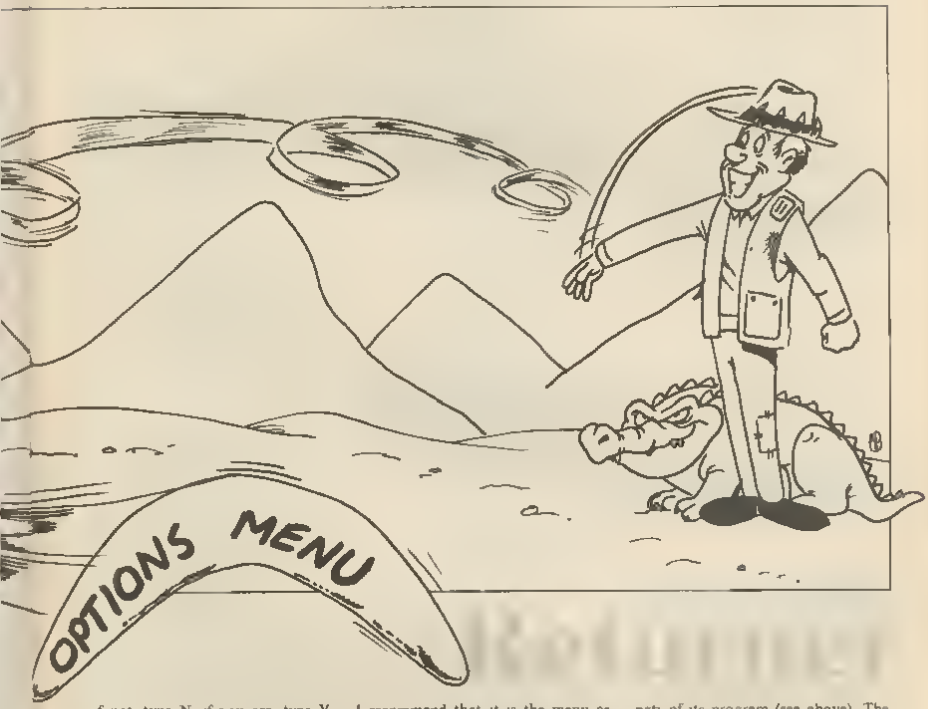
Load 'EDIT" 8 and run

The screen will ask for the new start address. You can enter it in Hex or Decimal numbers (the Checker program provides location values in decimal).
Once entered press return.

The screen will then ask you to state which file you want to be automatically loaded when you press the RESTORE key. If not MENU, then alter to your own requirements – press Return.

The screen will then ask what name you wish to give the Returner program. Put your own name in. The screen will then ask "Are You Sure?"

Returner



– if not, type N, if you are, type Y N returns you to the beginning of the screen, and you will have to re-input memory location etc When you type Y, it will save the newly-named program to disk

Starting up your computer

When you start up your computer, you initially load and run the program you named and saved above It will automatically install the RESTORE key function and run the program you asked to be first loaded (see above) I recommend that it is the menu as pressing the RESTORE key will automatically return you to this program until the computer is switched off

Note A good place to put the 'Restorer' program in memory is #20 ($334), as it is not normally used when using disk It relates to the tape drive use, so you won't be able to use the tape drive

If you have a multipart game, Restorer can be used to restart the game by asking it to automatically load in the first part of the game as part of its program (see above) The start program must however, have a Basic line number at the beginning e.g 10 SYS3000

Addition to Returner instructions

It is not recommended to press RESTORE during the use of the disk drive or printer, as the menu may not work properly if you do so

If you need to press RESTORE while the printer or disk is in use and the menu doesn't work properly, then just press RESTORE again and the menu should work properly

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Oxford Basic

Despite its name, this is a compiler with several very interesting extras

By Norman Doyle

The Oxford Basic package is a suite of four programs designed to get the best from Basic and beyond. The main part of the program is a stunning compiler but, before using this section, the program has to be optimised.

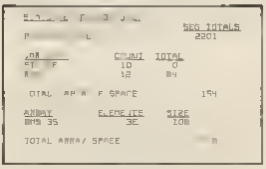
At the beginning of the whole process, a good set of utilities can speed things up and keep it all neat. Oxford Basic's Toolkit fits into the high memory slot at 49152, and offers ten new commands which are outlined elsewhere.

One glaring omission is an automatic line-numbering command, and another is a command to undo the execution of a NEW or a recover a program after a reset. It's only my opinion of course but to me these missing commands would have enhanced an otherwise comprehensive package.

Vital Statistics

The Adalyzer really gets inside a program and squeezes out every possible value and measurement that the programmers could think about. It takes a little time for the program to be read in but the wait is worthwhile, because there are seven options available for analysis afterwards.

A Flow Cross-Reference revealed the following facts about the program:



The first number in the GOSUB section is the line that is accessed and the line numbers that follow are the lines which call up the routine.

When a Data Cross-Reference is called, the variables are listed, followed by the line numbers where they appear:

```
DATA CROSS REF REPORT FOR DISK

ARRAYS
BMSC     460   510   710   760   820
         830   850   860   870   880
         900   910   920   930   950
         960
STRING VARIABLES
A$       110   170   190   810   820
         830   840   880   910   930
         950   970   980   510   520
         730   740   750   770   830
         880   890
B$       380   420
ONE      170   540   580   580
C$       130   140
F$       210   240   370   380   420
         600
K$       540
N$       850   910   410
P$       230   420
S$       240   420
T$       250   420
REAL VARIABLES -
A        300   330   480   490   510
         550   570   820   830   850
         860   870   880   800   810
         820   830   850   580
B        580   600   620
BF       710   720   740
BL       350   370   380
BM       510   710
BT       370   460   700   740
C        130   140
F        230   240
FT       600   630
S        130   140
ST       200   610   650
T        130   140

LOOP VARIABLES -
A
```

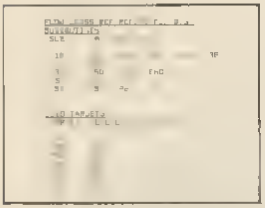
As a program is developed, it's easy to forget to delete lines which are no longer needed. The Deadwood Analysis cleverly scans through the program to find lines that will never be accessed. The offending lines are then listed, and a deadwood-free listing generated if required.

Another improvement can be made through the Create Header File option, which generates a short program to initialise all of the variables used in the program. The file is then saved and can be MERGEd with the main body of the program later using the Toolkit. Initialisation may seem as redundant as the LET command, but it can actually improve the speed at which the program operates.

When a variable is encountered in a program, the computer checks through the list of existing variables to see if it's a new entry, or a modification of an existing one. If the label proves to be a new one, it is tagged onto the end of the current variable list. This involves a substantial degree of memory movement and consequently wastes time.

Added to this, a variable which is commonly used may be at the end of the list, which means that the routine has to check through the full list before the current value of the desired variable is discovered. The generated header program avoids these time wasters by reserving space for the variables in descending order of frequency right at the beginning of the program.

A list of program statistics can be displayed so that memory and variable usage can be recorded. The Generate Stats option also summarises other facts such as the number of lines used, GOTOs and GOSUBs as well as the total number of variables and arrays.



There is also a menu option for checking the disk directory, and to make sure that any files have been successfully saved

The reports given by the stats generator and the flow and data cross-reference options can be saved to disk alongside the finished program There is no direct hard copy option, but a utility file is included which will read a stored report to the printer for future reference

Arranged Crush

The final pre-compilation routine is the Compressor, which reduces the program to its absolute minimum size As each line is scanned, the routine removes all REMs and spaces but the compression goes beyond this Lines are combined to squeeze in as many commands onto a line as possible

After compression, a printout of the program may contain lines which physically span three or more screen lines This is possible because the Compressor works with raw program code so that a command such as PRINT only occupies one byte rather than five A line could therefore contain as many as 38 PRINT commands which would expand to 228 characters and colons or five screen lines! This would make editing impossibly difficult, so the program must be thoroughly debugged before this operation is performed

Although this optimises the program's memory usage difficulties were experienced when using the compiler so I eventually decided that compression was probably better used on programs which wouldn't be improved by compilation

Full Speed

OX-Comp is one of the best compilers that I've ever seen It is a full-facility, four pass compiler which can cope with all of the commands in the C64's Basic library The program also accepts all types of variables and arrays up to two dimensions Three dimensional arrays can be compiled, but only after the program has been pre-processed by a special utility which is included on the disk

A compiler converts Basic code into a special form of machine code which runs up to 40 times faster than the original program When a Basic program runs, the operating system has to scan each line in turn turn each command into an action, and create and modify all of the variables it encounters

A compiler scans through the Basic program and converts all of the commands and their parameters before the program is stored on disk The conversion also means that sufficient space can be made for all of the variables which are to be used The finished program is therefore midway between Basic and pure code

The initial compilation can take a long time to produce, because the full program is scanned and rescanned four times before the final program is produced During these passes the compiler produces and erases temporary work files which adds disk access time onto the process A long program can take up to half an hour to prepare but the results are worth waiting for

Wisely, the producers insist that the master disk should be used as little as possible, and a special back-up routine is included which remasters the compiler and its associated utilities onto separate disks Unfortunately the back-up is not the most efficient of utilities, and each sub-program is transferred individually, regardless of whether it occupies one block or 20 The result is a constant swapping of disks, which makes the whole process very laborious and unnecessarily long

Once the copies have been made, the compilation process is automatic, and the program to be processed is placed on the same disk as the copied compiler This can cause problems with disk space, but this problem has been anticipated by offering suitable error message generation and options to erase programs which will no longer be required for the final compilation

even the original program can be erased once compilation has progressed beyond the first pass

The limitations of the compiler are surprisingly few and petty Arrays must be finitely dimensioned, which means that DIM A(23) is a legal statement but DIM A(X) would be queried If an array slips through to the compiler, which lacks an explicit dimension the program interrupts compilation to ask for a suitable array size before continuing through the rest of the program This may limit the efficiency of memory usage, but few programs would suffer appreciably by this insistence on explicit dimensioning

The only commands that the compiler rejects are LIST CONT, SAVE and RUN when it has a line number parameter LIST is excluded because there is nothing to list in a compiled program, CONT is an acceptable omission and most people could live without commands such as RUN40 when a CLR RESTORE GOTO40 could be substituted instead SAVE is harder to live without but this could be remedied by including an SYS in the original program to a suitable machine code patch

One worrying problem which revealed itself under testing was that the maximum string length is 254 characters instead of Basic's 255 This must surely be an oversight on the part of the programmers because it is not documented in the manual Such errors are slightly disconcerting because they only show up at runtime, and I'd rather not sit with my fingers crossed while a program compiles hoping that another unforeseen error occurs

All compiled programs are executed with the RUN/STOP key disabled In most cases this is unimportant but it may be necessary to allow such an interruption so a special form of REM statement has been devised to allow the key to be enabled and disabled

Error Tracing

If errors occur when the compiled program is being tested, it can be difficult to relate the problem back to the original program An error which stops the execution of the program will generate a message which is similar to Basic's equivalent message but instead of a line number a memory location is displayed

A utility on the disk can be given this value and it will then automatically cross-refer this and indicate the corresponding line number in the original program to assist debugging Of course, such an error should rarely occur because any sensible programmer would have tested and

debugged the original program before compilation wouldn't they ?

Another utility which can aid debugging was actually devised for hybrid programs which require parameters to be accessed by a machine code patch Variables and arrays are stored differently to the compiled program so any associated code routines have to be modified This works in favour of routines which access a current variable value because the memory location of variable data is fixed in a compiled program REPORT is a utility which scans the original program and prints out a table of variable locations to ease the problem of conversion

Dotty Protection

Why, in this day and age of colour photocopiers and cameras, do software houses insist on these ridiculous colour charts? I don't mind protection systems, but I object to this form because I am red green colour blind and the companies always seem to insist on using red, green and two other colours on these charts Why black, white, red and yellow can't be chosen defeats me

In this case the problem is increased because each of the four programs is individually protected In the end, I got so annoyed that I resorted to backing up the programs using a cartridge copier so much for protection!

Despite this, the package maintains a very high standard throughout all four sections Maybe if the space under the ROMs had been used, the toolkit could have been more comprehensive in the manual, but no compiler is perfect and this compiler is comparable though slightly inferior to Supersoft's *Blitz* What this has to offer which *Blitz* doesn't is the other three packages which make this package stand out against the opposition

Toolkit Commands

CHANGE
DELETE
DUMP
FIND
INFO
MERGE
QUIT
RENUMBER
SIZE
TYPE

Analyzer Options

Flow cross-reference
Data cross-reference
Examine disk directory
Deadwood analysis
Create header file
Generate stats
Return to Basic

Compressor Functions

Removes spaces and REMS
Compacts program lines

Ox-Comp Facilities

Majority of Basic 2.0 commands
Four pass operation
Error checking
Location of variables printout

Line Input

Improve your 64's input with this handy utility

There are times when the standard Basic keyword "INPUT" on the C64 is a bit of a pain. In the event that a comma (",") needs to be input as part of a string "INPUT" cannot do it, because the comma is interpreted as being a delimiter between different lots of data which are supposed to be assigned to separate variables.

If you wanted to enter such a string then it has to be enclosed by quotes so that "INPUT" will read in every character. This looks silly on the screen, and is very confusing for users of the program who are not familiar with the technique – they can't understand why some text has to be enclosed in quotes in order to enter strings including commas, whereas other forms of input such as numeric data do not. It's even more confusing when the program later requires that the user use the comma to separate input into different fields!

The other slightly aggravating thing about 'INPUT" is the fact that the '?" prompt is always printed on the screen prior to ' INPUT ', waiting for keyboard entry This is sometimes a nuisance, since the message which asks for the input on the part of the user is not always of a kind where a question mark at the end is relevant that is it's not a question Add to this the need to follow it with quotes and then rub this out and type quotes again so you can use the cursor move keys to edit the line – just so a comma can be included where required in the input string, and straight away we already have two irrelevant characters on the screen before anything is actually typed in

What's more, you always forget to use the opening quotes at the start which itself suggests that it doesn't feel natural to have to do this The situation is worse when inputting from an external channel here not only the comma but also the colon and semi-colon are interpreted as carriage returns or the end of the string, whereas in actual fact it may be nothing of the sort Again, enclosing the string in quotes before it is saved to the external device prevents this, but on inputting it back the quotes will have disappeared In either case, whether inputting from the keyboard or an external device, quotes cannot be included as part of the text. But why not, you may ask?

"GET" will input anything from the keyboard, and a string comprising all printable characters can be built up using "GET" But the Basic coding required to interactively edit this string at the same time rapidly becomes unwieldy and slow Also the input is not automatically echoed to the screen, so this must be done in Basic There's no flashing cursor either

A cursor can be forced but it has the peculiar behaviour of leaving some characters in inverse video as soon as the cursor move keys are used "GET ' can be used to input text from an external device, but using Basic commands that retrieve one character at a time and build it into a string can be time-consuming to say the least It's frustrating when all you want is input some text of an 'unusual' format

If you're a machine code programmer of any skill, then this can be got around except that you may find yourself having to re-develop the coding to suit the requirements of different programs But if you want to stay in the Basic environment then while 'GET ' and "Input( )" have their place (and are very good at what they do) what is really needed is a new Basic keyword, one than will input strings of all printable characters

Well here it is Inspired, as it happens, by the IBM PC BASIC A's action keyword of the same name the utility is called "LINE INPUT( )" and is in the form of a machine code routine stored at $CAC0 to $CBBD high up in the free RAM area above the 64's BASIC interpreter In actual fact, it is not a real keyword at all, but a "SYS" call which cheats by pretending to be an interpreter routine

This is necessary because of the sort of information that the routine needs in order to carry out its task The "USR" function only allows one numeric value to be passed on to a machine code routine which then can only return one other value to a variable The temporary register storages for 'SYS" calls are rather long winded to use and in any case none of these are any use because "LINE INPUT( )" must return a string in a string variable

The simple answer is for the routine, "LINE" to get these parameters direct from the current Basic line being processed using the subroutine "CHRGET" which retrieves the next BASIC byte into the accumulator and also incidentally is the thing that skips spaces not in quotes in exactly the same way as all the interpreter routines get their information This makes "LINE INPUT' very easy to program in Basic because if you excuse the presence of the word "SYS" at the front it will appear in the listing and in operation, like a valid Basic key word Furthermore, if you make a numeric variable equal to the "SYS" call address and name this variable 'LINE", the subterfuge will be complete The syntax then is as follows

SYS < address > INPUT (# < channel No >,) < string variable >

Note the full stop between < address > and INPUT(#) This is very important as it ensures that the following valid BASIC keyword, "INPUT" or ' INPUT # ", is crunched down to its proper BASIC token when the BASIC line which contains it is entered Neither of these will be executed by the interpreter in the normal way However they exist here exclusively for use by ' LINE" In fact the processing activity of ' LINE" will make whichever of these two tokens inaccessible to the interpreter

The keyword for 'INPUT" or ' INPUT # " is included because "LINE' has to vector within itself to the appropriate processing for either inputting from the keyboard and screen, or from an external device The keyword is tokenised for three reasons 1 to save memory space, although this will be negligible 2 because it's a professional way of doing it, 3 since ' LINE" uses it to find out which form of input is required it simplifies things greatly if only one byte can be examined instead of a string of characters This token, and the remaining parameters are read by "LINE" direct from the Basic text using ' CHRGET"

A number of subroutines are used by "LINE" to read the parameters They themselves get the Basic bytes using 'CHRGET" One of these is a contrived subroutine alled "GET VAL" located at $CBA7 (52135 decimal), and looks like this

```
READ    EQU   $AD8A
FIX     EQU   $B7F7
ORG           $CBA7
GETVAL  JSR   READ
JMP           FIX
```

'READ' is part of a Basic interpreter routine which pickes up a numeric value from the Basic line currently being processed The value may be written as a string of decimal numbers, or be in the form of a numerical variable Whichever, "READ" converts it into floating point format and stores in Floating Point Accumulator # 1

"FIX" is the familiar float to fix' interpreter routine The contents of FAC 1 are converted into a 16-bit integer and stored in zero page locations $14-$15 hex

Therefore "GETVAL" performs the action of reading a numeric value or a variable's contents from a Basic line and making same available in handy double-byte integer format in $14-$15 for a machine code to use, if ' GETVAL ' is handled properly It helps in understanding how "LINE" operates that the C64's Basic interpreter follows a special convention that every interpreter routine, including those used by "GETVAL", expects the first Basic byte that it has to deal with to already be in the CPU's accumulator Or, to put it another

way, every Basic interpreter routine calls "CHRGET" to get the next byte of Basic text into the accumulator before it exists Also "GETVAL" is a little bit limited, only positive numbers in the range 0-65535 are allowable otherwise an "ILLEGAL QUANTITY" error is generated. Invalidly entered numbers produce "SYNTAX ERROR"

On calling "LINE" with the "SYS" command- true to the convention, the interpreter runs "CHRGET" to load the accumulator with the next byte of Basic text Unfortunately this doesn't arrive intact when "LINE" takes control, because the action of executive "SYS" loads the accumulator with the contents of the 'temporary storage for A reg location at $030C (780 decimal) So the accumulator has to be refreshed with a called to "CHRGOT", a letter part of 'CHRGET" which gets the same BASIC byte again This byte must be a full stop (" ") or $2E, if it is not a jump is made to $AF08 which prints "SYNTAX ERROR IN LINE < n >", and terminates the Basic program The byte following this, retrieved by 'CHRGET', must either be a token for "INPUT" or 'INPUT#" If it is neither of these again a jump is made to "SYNTAX ERROR"

Otherwise at this point the routine "LINE" deviates The bulk of the routine comprises two separate processes, the one chosen depends on whether the input is from the keyboard and screen, or whether it is from an external device

LINE INPUT from keyboard and screen

Syntax:
SYS < address> INPUT < string variable >

Example:

100 LINE - 51904
110 SYS LINE INPUT A$

Input from keyboard and screen is carried out in three stages Firstly the screen RAM address for the start of the input is found by locating the cursor position with the kernal routine "PLOT" and calculating the screen address by the rather crude method of adding 40 to the screen base of 1024 'y' (row count) number of times 'x' (column count) is added to the result I did originally write a proper multiplication routine, but this required so much code that it wasn't really worth it The calculated address is stored in free zero page locations as a pointer

All you see on the screen is a flashing cursor with no "?" prompt Now a kernal routine called "CHRIN' handles all the character getting and printing with full editing support and proper flashing cursor In use it is identical to using the Basic editor in direct mode It has the same limitations – if quotes are keyed then cursor move keys come onto the screen as characters, but rubbing out quotes and re-keying stops thus "LINE ' discovers the length of the line This is done by searching backwards from the maximum string length position, the default of which is 80, looking for a non-space character On finding a non-space character, its position ahead of the start of input becomes the new string length

The screen line from the start address up to the string length, is copied to a buffer This is our old friend the cassette header buffer at $033C However $033C is reserved to hold the string length count, so the buffer actually starts at $033D A conversion routine is used to translate screen coded characters into CBM ASCII, and the most significant bit is stripped off in case the screen characters were inverse video ("LINE INPUT" needn't input a line which has just been typed, it could just as easily have been PRINTed instead and the keyboard buffer POKEd with a carriage return)

At the end of this the string is stored in the buffer and its length in $03CC At the final stage "LINE ' calls interpreter routines 'LOCATE", which goes in search of the string variable through the variable storage area – "LOCATE" gets the variable's name from the Basic line If it does not exist then it is created After this the string storage for the variable, if already in existence, is freed (by 'FRESTR") and then a fresh storage area is defined using "STRRES" which does so according to the new string length passed to it We now have a place in the string storage area to which the contents of the buffer can be copied

It is impossible for characters to be put in this area directly (without being stored in a buffer first) because "LINE" does not yet know how long the string will be until this stage

In this manner any string variable can be created or updated using "LINE INPUT" in just the same way as it can by any other INPUT function However some care is required where the variable is one of a dimensioned array Small arrays up to a 'safe' limit of say 10 or 11 elements would be okay in other words

110 SYS LINE INPUT T$(n)

Where 'n' is an index from 0 to 10 in the default provision for arrays up to 11 elements but otherwise a 'working variable' such as IN$ for example would have to be used to transfer the input to the element where this is one of a large, dimensioned array, e g
110 SYS LINE INPUT IN$
120 A$(n) IN$

If this precaution is not observed the process becomes too complex for the simpler than normal string building techniques used and usually crashes the 64

Whatever the string is stored in the proper place, and the extra does not add perceptively to the processing time, even if a large string array is being filled with text

Because "LINE" is located in RAM it can be modified I mentioned that for input from keyboard and screen it has a default maximum string length of 80 screen characters (two screen lines) It doesn't matter in which column across the screen the start of input occurs, the maximum remains 80 characters You can change the maximum length by a POKE to suit your own requirements For example, a disk file name cannot exceed 16 characters in length If "LINE INPUT" is used to get the file name it can first be modified only to accept

up to a maximum of 16 characters In the source listing the maximum string length is labelled "MAXLEN ' and is at 5CB4D (52045) Use the following

100 LINE - 51904

1000 MAXLEN 52045
1010 POKE MAXLEN 16
1020 PRINT 'ENTER A NAME FOR THIS FILE",
1030 SYS LINE INPUT IN$
1040 NM$ - IN$+",W S"
1050 OPEN 2 8 2. NM$
1060 etc

You can type as many characters as you like for the file name, only the first 16 will be taken any notice of after you press [RETURN]

Be aware though of a couple of limitations of "LINE INPUT" One is the same as that of the normal "INPUT", namely if other characters present on the screen come within the range of the maximum string length, it will be assumed that these constitute the end of the string, even if you don't want them Enough blank space must exist beyond the position where input commences to prevent this

Also, "LINE INPUT" doesn't know if the start of input occurs on the bottom line of the screen. If the screen scrolls up where text exceeds one screen line, the start address is not adjusted up with it Also "LINE INPUT" will assume that the 'rubbish' beyond the top of the screen RAM area are characters to be input' Consequently "LINE INPUT" should not be used any lower than the 24th row down
LINE INPUT # from an external device

Syntax

SYS < address > INPUT < channel No >, < string variable

Example

100 LINE - 51094

1000 OPEN2, 8, 2, "TEXT"
1010 SYS LINE INPUT 2,A$
1020 etc

This is the only time that "GETVAL" is used and even then only the least significant byte of the resultant integer is needed'

'GETVAL" retrieves the channel number following "INPUT #" so that kernal routines can route input from the appropriate channel Inputted characters are copied to the buffer, a process that continues in a loop until one of three conditions are true
1. The ST variable indicates an EOF signal from a disk drive On detecting "EOF" inputting is terminated
2 The character read in is found to be the termination character The default termination character is a carriage return (13) on encountering the termination character inputting is terminated. The termination character is NOT copied to the buffer.
3 The maximum number of bytes have been copied to the buffer The default maximum number of bytes is 128 On the 128th character being copied to the buffer, inputting is terminated

On input being terminated, "LINE INPUT #" goes to the final stage of building the string to memory exactly as before As far as "EOF" is concerned, it will be required that the BASIC program using "LINE INPUT #' should also monitor the "ST" variable Re-using 'LINE INPUT #" and forcing input past EOF causes a rubbish character to be copied to the buffer, overwriting the previous string This is not a problem if other variables have been made equal to this string

As before, because the routine exists in RAM, it can be customised to behave in a special way "CHKCR" is a label in the source listing which represents the point where the character read is tested to see whether it's the termination character or not It looks like

CHKCR CMP # $0D

Where the operand is the value, in this case 13 This can be changed as in the following example
CHKCR - 52065
POKE CHKCR + 1,0

Now the routine will stop reading when it encounters a zero byte Similarly the maximum number of bytes copied to the buffer can be changed

CHKMAX - 52079
POKE CHKMAX + 1, < n >

Where < n > is any number up to a limit of 191, because this is the maximum amount of space available in the cassette buffer area.

Even better, "LINE INPUT #" can be made to ignore any termination character Following the "CHKCR' location is this

ISTERM BEQ PUTLEN

which is where a branch is made to the final stage upon encountering the termination character By using

ISTERM - 52067
POKE ISTERM, 234 POKE ISTERM + 1, 234

This has the effect of overwriting the branch instruction with "NOP'S", so the routine cannot exit if a termination character is found This allows enormous flexibility for inputting data of a 'strange' nature "LINE INPUT " can read in all byte values 0-255 It is possible for example to read machine code into string – supposing you wanted to do such a thing!

Because "LINE INPUT(#)" is completely self contained, i e no part of the conventional interpreter INPUT(#) routines are employed, we are allowed to do something normally quite illegal The following is possible in direct mode

LINE - 51904

READY
OPEN 2, 8, 2, "TEXT"

READY
SYS LINE INPUT 2,A$

READY
?A$

This is incredibly useful for verifying that a Basic routine that you are trying to de-bug has saved data properly or not It's normally impossible to get at this data in direct mode, since using "INPUT #" results in an illegal direct command error You can go on moving the cursor up an dinputting and displaying successive fields of data This even works with numeric data saved using "PRINT #", since these are written as decimal strings

If you have an assembler you can enter the source listing, and if needs must the ORG statement can be changed to relocate the routine anywhere you like, but make a note of the new label locations if you then want to customise it with POKEs It's unlikely that you will need to use "LINE INPUT(#)" very often, but when you do, you'll be glad it's there

A Flow of Ideas

How easy is it to incorporate a disk directory reader in a program?
By Norman Doyle

It's often necessary to view a directory from within a program, but from Basic this can be very difficult. There is a way, and this method can reveal more information than may at first be obvious.

Before a disk directory program can be written, it is essential to know what data the drive makes available. Using the following short program on the directory in Table 1 gives all of the information which is displayed in Table 2.

```
1 OPEN 8,8,0,"$":P
2 GET#8,A$,B$:A=ASC(A$+CHR$(0)):B=ASC(B$+CHR$(0))
3 PRINTA+B*256;:PRINT" ";:FORA=1TO4:GET#8,A$:PRINTA$;:NEXTA:PRINT" ";
4 GET#8,A$:IFA$<>CHR$(0)THEN4
5 PRINT:GOTO2
```

The rendered data includes the Block Allocation Map (BAM) which lies from $C002-$CXXX, as well as the directory content itself ($CXXX-$CXXX). Using GET#, each byte can be read and used to form quite a powerful source of disk information.

From this readout, the aims of the program can be derived. What we will create is a flow diagram for a program which lists each directory entry, the file type, blocks used and the track and sector (the specific block location) relating to each file. As the program runs, it will keep track of the total number of programs on the disk for a general round-up screen, which is to be displayed after the individual program detail screens.

The program can also keep a tally of the total number of blocks used, and this value can then be compared with the number derived from the BAM to ensure that the disk has been validated correctly. Finally, a detailed map of the number of free sectors (blocks) on each track can be displayed using colour to differentiate between tracks which have not been used at all, and those which have lost a few sectors to file storage.

The first duty of the program is to set the screen colours and then initialise the disk under examination. This means opening command channel 15, and keeping it open for checks on disk errors throughout the program.

Next, the directory file is opened for a sequential read operation. After the drive loads the first sector into its internal buffer, variables are initialised and dimensioned ready for the main program to begin. The reading of the BAM takes a little time, so a comforting message is displayed to assure the user that this is a normal occurrence.

Exploded BAM

The layout of the BAM can be seen from Table 3. There is no single byte pair responsible for recording the number of free bytes on the disk, so this value has to be derived from the data at the beginning of the BAM. The first two bytes (the track and sector links) are not loaded when the directory is read as a sequential file, and the next two bytes are irrelevant, but some of the next group of bytes are essential to calculating the number of free memory blocks on the disk.

The information is stored in a specific way, with the bytes grouped into clusters of four. The first byte is the total number of free blocks on a particular track, and the three bytes that follow can be used to calculate which particular sectors these are. In this case the only byte of interest is the total number of free blocks, so that is read and added to a running total while the others are discarded.

Apart from keeping a record of the total number of free blocks, each track's details must be stored in an array if the aim of producing a tracks map is to be fulfilled. There are 35 tracks on a normal Commodore disk, and it can be seen from Table 2 that there are, in fact, 35 groups of four bytes in the BAM. A loop must read each of the groups, storing the first byte in an array and adding its value to a grand total of free blocks. After this is done, the next three bytes can be ignored.

At the end of the BAM, the disk name and ID numbers can be found. This must be read and stored in a suitable form for display at the head of each screen page. First of all, the string is initialised to produce a label indicating that what follows is the disk's title and, to comply with Commodore's convention, the RVS ON character is added to display the disk header in reversed characters. A second convention is to place the disk name in quotes. This is not catered for from reading the directory file, so the opening quote is added at this point.

The disk name is allocated a space of 16 characters in the BAM sector of the directory. This means that by simply reading the 16 character group and adding it to the title string, any disk name can be catered for without any complicated checks. The resultant string is then completed with a closing quote mark.

To complete the screen page header, the next 15 bytes are added to the string. This actually reads more than enough characters to cater for the ID and the disk type descriptor (always 2a) on a normally formatted disk, but is extended to cater for non-standard formatting using four character IDs and other such tricks. The difficulty here is that some of the bytes will be stored as 'null values', which is the reason why string variables are being used in the program instead of numerical ones to avoid generating errors.

Because the bytes are stored as ASCII values, the conversion routine must look for these nulls and convert them to CHR$(0) to avoid similar errors when the bytes are converted for use. This happens quite a lot, and a subroutine is the ideal answer. Once the disk name has been rendered as

a string, it is printed and because this string contains the clear screen symbol, the name acts as a title for the screen page

Before reading in the directory entries, the column heads must be displayed The convention that has been derived for this routine is that the program name will be followed by the file type block count and the track and sector values for the first program block

This information is not stored in the correct order so it must be read, stored and sorted out in a print statement The layout of a single directory entry can be seen in Table 4 A subroutine deals with the actual reading of the individual entries, and this will be examined later

As each directory entry is dealt with a counter is incremented so that a check can be made for a full screen page (20 entries) When this number is reached a 'Press Any Key' message is printed and a keypress detection loop initiated

Directories come in all shapes and sizes, so the program cannot work on a simple loop to read in the entries A way is needed to indicate when the directory is complete This is done by reading the system variable ST When this has a value of zero, work is still in progress, but if it has a real value one of two things has occurred

It may just be that the directory has been read in completely, or it could be that an error has occurred Before closing the file, the routine checks the error channel If an error is detected, the program will halt and the message is printed, if there is no error the program continues to the next stage

Under a screen page title of 'Vital Statistics', the details of the number of programs and blocks used are printed suitably labelled Both are derived from the individual directory entries and supplied via the 'read entry' subroutine

The free blocks' value has been calculated from the BAM record but before this is printed we can use this value and the 'blocks used' value to check for a correctly validated disk If the number of blocks used is subtracted from the total number of blocks free on a newly formatted disk (664) the result should equal the BAM-derived free block count

Any inequality means that the BAM is faulty, and this is flagged by a suitable message A word of warning – inequalities could be the result of REL or USR files being used on the disk, so ensure that this is not the case before validating, or you could lose valuable data!

After the free blocks have been displayed, a table is drawn up with the tracks listed above their unused sector values At each stage, these values are checked against the sector capacities for each track If none of the sectors have been used, the value is printed in brown, but any tracks which contain file data are highlighted by using light blue characters

This program can easily be extended and improved to give a full BAM map, or reduced to produce a disk to screen directory printout

The subroutine to reach each directory entry is an integral to the running of the main program and, therefore, worth a closer look

Directory Delivery

The directory read routine takes over immediately after the disk name has been read from the disk The directory details are preceded by a series of null bytes which must be discarded until a 'real' byte value is read in This method saves time but has one serious drawback when the first file has been deleted and not replaced

File types are denoted by byte values as follows

129 = SEQ
130 = PRG
131 USR
132 = REL

If the file is 'locked', or protected these values are increased by 64 to give a range of 193-196 Deleting a file simply results in these values being replaced by a null byte Using the method of discarding null bytes would mean that the first significant value would be the old track number when a deleted file was encountered

Consequently, the program includes a check to see if the value read is in excess of 35 If this is not true then it must be a deleted file so 'DEL' is assigned as the program type and the routine jumps to evaluating the read in value as a track number If the value is valid for a file type, a check is made to test if it is locked or not Provision is made to denote a locked file by using a reversed 'less than' symbol, which is saved as a string If the file is unprotected this string remains as a space

A second string is derived from the file descriptor value This is the file type which is calculated directly from the file type value in conjunction with a MID$ statement After the next byte has been read in the pathway which the DEL file option took converges with the main program so that the track value can be assigned to a string before the sector value is read and similarly stored

The disk name had 16 bytes assigned to it, and the same is true for the program name which follows the sector byte A loop reads this in and concatenates a string If a program name has less than 16 characters, the entry is padded out with shifted space values (160), and this is useful for formatting the screen printout later, so they are not discarded here

After the name there are nine zero bytes which are read in and disregarded, so the next significant bytes denote the number of blocks that the program occupies This value is stored in low byte/high byte format and a suitable routine is included to reveal the true decimal value All that remains is to print the information out in the correct screen columns Deleted files names are shown in orange and existing files in white

One problem with filenames is that they sometimes contain control characters such as screen clear, case switch or even colours To avoid these messing up the beautifully formatted display, location 212 is poked with a value to fool the computer into thinking that it is in quotes mode, so that the reversed character is printed instead of the action which it represents being executed Once the rest of the information is printed control is then returned to the main program

Directory Flow

The flowcharts show the logic of the program contained in the Listings pages This is rendered as a Basic routine, but the beauty of flowcharting is that the same logic pathways can be applied to machine code or just about any other language that has been invented

If you decide to investigate directory reading further, you'll also soon realise how useful the charts are for modifying the program It's far better than muddling through reams of listings noting variables and then trying to make sense of it all

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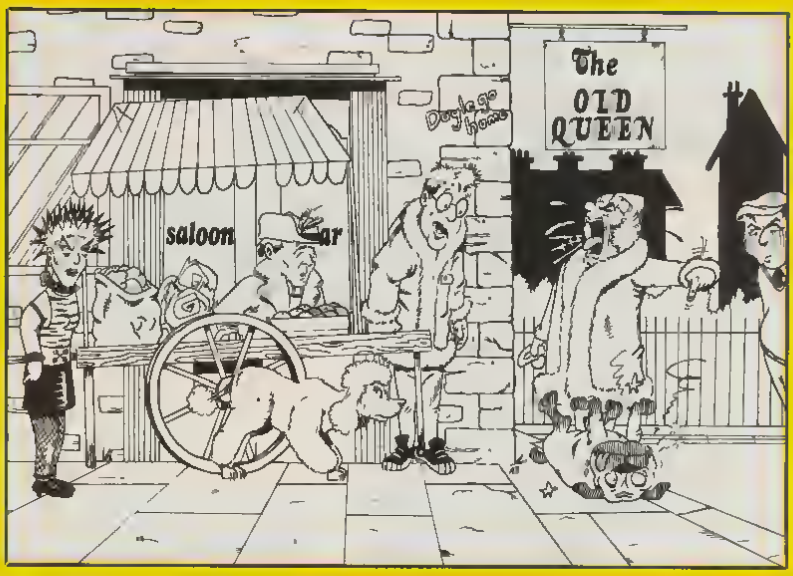
Deadenders



War in Middle Earth

GAMES UPDATE

Deadenders is an adventure based on everyone's favourite soap opera *Neighbours* Nah, seriously guv it all takes place in Herbert Square, home to the Squeals Foulups and other unsavoury characters

The story starts after Etfl has lost her Willie Yes in case you haven't guessed, it's a spoof full of caricatures and one or two slightly naughty jokes

You play the part of PC Donald Dance and your mission, should you choose to accept it, is to find out who did the dirty on Willie The inlay tells you that poor old Willie turns up squashed, and with two holes in his neck Leave it out mate, the missis'll never believe this'un It also goes on to say that you can talk to the characters that you meet 'Ask Bendy about Colon" is cited as an example I tried it, and was met with a "You speak but it doesn't further your enquiries ' None of the Deadenders wanted to talk to me Was it something I said?

The jokes are obviously geared towards Eastenders fans, but I can quite believe that non-followers of the series would get at least a smile from the game Most of the humour, for me at least, came whenever I examined a character When I examined Scary, I was told 'Purple eyes and bright green hair she resembles a technicolour skunk ' Great stuff All the descriptions are along these lines and most are less than charitable

When it comes to gameplay, I have a few reservations The game doesn't accept some of the normal abbreviations I had to type in 'inventory" as opposed to just "i" Not all the exits were listed even the ones that should have been obvious and mapping left something to be desired When standing on the landing of the Old Queen, I was faced with the kitchen bedroom and living room, yet no directions were given It was a case of "enter kitchen" etc and no matter which of them I went into the exit was always to the south This system wasn't used consistently though From Herbert Square I could see the pub the cafe and the coroer shop This time I had to input the usual N, S E and W, and hope I went to the building I wanted Some things should be taken for granted in an adventure and sticking to one way of inputting directions is on this agenda.

During the course of the game, I came across two bugs one funny and one annoying Id got a box from Arfer and, whenever I tried to examine it, the game crashed However I was allowed to "search box" with no ill effects Later, I discovered that I could "exam box" but only if I wasn't carrying it I can just imagine how frustrating it would be for someone to find that out after going for a long time with no saves! The other bug was a silly one I'd been searching through a dustbin as one does, and my investigations took me to the launderette where I was reminded how disgusting my uniform was No problem I took it off washed it in a machine, got it out again then found out I had two uniforms one wet and one dirty

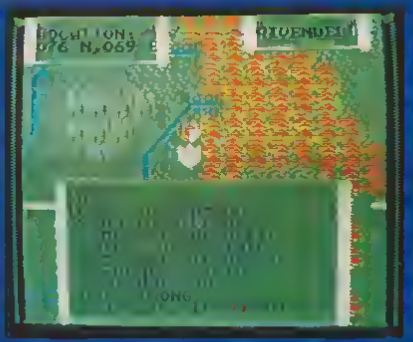
In keeping with the spirit of the game there's no ordinary reply when you tell the computer to get something Instead you get a cheeky ' Right, me old china. Should any copies of this game reach America, it will only reinforce their beliefs that we all talk like Dick Van Dyke

The authors have got a nice line in schoolboy humour which I greatly appreciate What a shame about the programming

If you can ignore the niggles that I picked on, get down the frog an' toad an' give your dosh to the geezer in the shop But if you're the sort who likes to be able to use single key inputs logical geography and no bugs, knock it on the 'ead

One last question Where was Kylie?

Touchline
Title *Deadenders* ***Supplier*** *Top Ten Hits MIL 12 Chiltern Enterprise Centre Station Road Theale Berks RG7 4AA* ***Tel*** *(0734) 302 600* ***Machine*** *C64*



enemy and the screen will swap to the battle screen showing all the combatants, who will start the fight without your help

You can affect the battle by using a cursor to move them into the fray or you can control one character directly. This may sound like a good idea but it doesn't quite work, as to select a character you have to position the cursor over his feet and the battles just take too long. This can be annoying, particularly if the battle was only a dodgy action while the party move through the area.

Unfortunately, this spoilt an otherwise interesting game which could have been so good.

Touchline:
Title: *War in Middle Earth.* ***Supplier:*** *Melbourne House, 2-4 Vernon Yard Portobello Rd, London W11 2DA.* ***Tel.*** *01-727 8070* ***Machine:*** *C64/128* ***Price:*** *£14.99 (Disk) £9.99 (Cass).*

Program Analysis

Programming can be made simple with these three C64 performance analysers

COMMODORE 64 PERFORMANCE ANALYSER

Basic is a programming language which makes it very easy for programmers to create complex programs with a minimum of effort. We pay a price for this programming ease and that price is often poor performance that is our Basic program runs slowly. Another problem which confronts the Basic programmer is what to do when a program runs without failing, but doesn't give you the results you expect. How do you find out what your program is doing without adding PRINT statements to your program to trace execution or interrupt execution at strategic points?

The Performance Analyser helps to overcome both problems. Not only does it trace the logic flow in a Basic program, it also determines how long each Basic line took to execute. Thus the Performance Analyser is a generalised performance analysis tool for the Commodore 64.

Performance Analyser TRACE Facility

Most commercial traces usually amount to a window displaying five or six line numbers on the screen as your Basic program runs. The line numbers scroll in the window as each line is executed, and the window may or may not interfere with your program output. You normally cannot trace a Basic program which uses hi-res graphics, and you certainly cannot go back and check the line number sequence previously displayed. Although you can usually slow the trace display down (by the space bar for example), you have very little chance of writing down the line numbers on paper for a more detailed analysis.

The Performance Analyser overcomes all of these problems. It allows you to trace any Basic program which uses normal screen graphics, hi-res screens, sprites or sound and does not interfere with the operation of the program. The Analyser will not slow your program down, and allows you to give the trace display at your leisure. You may scroll backwards or forwards through the line numbers for as long as you wish.

Performance Analysis

The Analyser also provides you with a tool to determine how efficient your Basic program is. When it displays the line number it also displays the time it took to execute the line. As you scroll through the line numbers you can tell at a glance which line numbers are slowing down execution and which line numbers are executed most often. Basic programs are the same as any other program: they follow the 80/20 rule. That is, 80 per cent of the work is usually done by 20 per cent of the program. The Performance Analyser is the tool you need to tell you which 20 per cent of your program is doing 80 per cent of the work, and how long it is taking to do it. You can then concentrate on making that part of your program more efficient.

Analysing a Basic program

The Analyser is written entirely in Machine Language, and is designed to cause as little interference as possible with the traced program. The Analyser is normally loaded at 38912, and all Analyser variables and constants are contained in the 2k from 38192 to 40959. Your Basic program thus has the RAM between 2048 and 38911, any low storage locations it requires and the free RAM at 49152. Should you require the RAM at 38912, then set the top of Basic pointer (55,56) to the last RAM location available to Basic, and the Analyser will use 2K of RAM before this address. For example, if the top of the basic pointer is set to 32768, then the Analyser will load itself at 30720.

Type in the Analyser loader program and save it as ANALYSER1. Make sure you verify that what you saved is correct. To use the Analyser, simply issue a load "ANALYSER1" after setting the top of BASIC pointer if necessary. ANALYSER1 will set the required Basic pointers, POKE the Analyser Machine Language logic into the correct RAM, relocate all required ML addresses and print messages to indicate how to start and stop the Analyser and display the trace data. The following messages are displayed on the screen by ANALYSER1 during execution.

```
LOADING THE ANALYSEK AT
38912
LOAD OK
RELOCATION OK
1 START ANALYSEK = SYS 38912
2 STOP ANALYSER - SYS 38915
3 DISPLAY DATA = SYS 38918
```

If the load fails, or the relocation of addresses fails, a message is issued and ANALSYER1 stops.

Obviously to start the Performance Analyser you SYS to 38912 or to the address displayed by ANALYSER1. You can do this from a program or from direct mode. The message TRACE STARTED is displayed by the Analyser, unless you start it from a program. The message is not issued then to ensure that the Analyser does not interfere with program messages or displays.

After the Analyser has been loaded, you then LOAD the Basic program or programs you wish to analyse. The Analyser monitors execution of your program(s), and saves trace data in the trace data buffer for later display. If you only want to trace part of a Basic program, you would do the following:

```
1000 REM START THE
ANALYSER
1010 SYS 38912
1020 FORTH - 6to6STEP 1
1030 X = A*COS(TH)
1040 Y -B*COS(TH)/C
1050 NEXT
1060 REM STOP THE ANALYSER
1070 SYS 38915
1080 REM DISPLAY TRACE
DATA
1090 SYS 38918
1100 END
```

After your Basic program has finished, or you stop it executing, you can stop the Analyser if you want to. However you don't stop it to display the trace data. You may leave it active to trace another program if you want to.

Obviously, to stop the Performance Analyser you SYS to 38915 or to the address displayed by ANALYSER1. You can do this from a program or from direct mode. The message TRACE STOPPED is displayed by the Analyser, unless you stop it from a program. Again the message is not issued to ensure that the Analyser does not interfere with program messages or displays.

Finally, you may display trace data at any time by entering SYS 38918 or SYS to the address displayed by ANALYSER1, and of course you may do this in direct mode or from a program. The message NO TRACE DATA is displayed by the Analyser if there is nothing to display. Again the message is not issued if you are under program control. This is to ensure that the Analyser does not interfere with program messages or displays.

If there is data to display the Analyser presents it in full-screen mode, that is a page or full screen data consisting of line numbers and line execution times is displayed and the Analyser ML program waits for you to press one of the function keys, F1 terminates the display, F5 scrolls back to the previous page of data and F7 scrolls forward to the next page of data.

You may scroll back and forward through the trace data for as long as you like with function keys F5 and F7. When the end of the trace data is found, the number of lines executed and the total execution time is displayed, and the Analyser ML program waits for you to press a function key. The Analyser will only recognise F1, F5 and F7 function keys. All other keys are ignored. If you scroll forward from the end of the display, you wrap around to the start of the trace data again. You can't scroll back from the top of the trace data, you may only scroll forward.

NOTE: Trace data will be displayed automatically when the trace data buffer area is full. The trace data buffer is actually the RAM under the BASIC ROM. As much trace data as possible is stored there before the execution of the Basic program is interrupted and the trace data displayed. If you want your Basic program to continue, simply press F1 and the trace display is terminated. Your program begins execution from where it was interrupted. If you want to browse the trace data, then use F5 or F7 to scroll back and forward through the data.

How the Performance Analyser Works

The Analyser works by monitoring the execution of Basic programs via the character dispatch vector in low storage. As each program byte is interpreted, the Analyser checks to determine if the current line number (57,58) has changed from the previous byte read. When the line number changes, then the Analyser stores the line number and current time in the trace data buffer under the BASIC ROM. This is done until such time as the trace data buffer is full.

When the buffer is full, the Analyser saves the first 2K of low storage (0-2047), colour RAM and various control registers in the RAM under the KERNAL ROM. The trace data is then displayed, and when the display is stopped via function key F1, the Analyser restores the first 2K of low storage, the colour RAM and the various control registers. This allows the Basic program to restart execution from the point where it was interrupted and the program screen is restored, as well as character colours and backgrounds.

If your Basic program uses the RAM under the Basic of KERNAL ROMS, then you cannot analyse it with this utility. Note also that if your

Basic progeam resets the time (TI$ = "000000"), then the Analyser will not fail, but the execution times displayed will be unpredictable

COMMODORE 64 PROGRAM ANALYSIS

Commodore 64 Program Analysis (C64PANAL) is a Basic program which analyses the contents of any Basic program and displays the information on the screen or printer C64PANAL first displays summary information which contains the program name, the size of the program in bytes, the number of lines in the program, the total number of commands (ie PRINT's, GOTO's, If's etc) and the number of variables

Once the summary data has been viewed, a detailed list of the commands used in the Basic program and the number of times each command is used is displayed When you have finished viewing the command data, a detailed list of the variables and the use of each variable is displayed, and when you have finished viewing the variable data you may end the display, ask for the information to be reshown or send the data to your printer

Using C64PANAL

C64PANAL allows you to analyse your Basic program It does this by running in the 4K of free RAM at 49152 to 53247, and loading the Basic programs it analyses at 2049 By not using the RAM between 2048 and 40960 C64PANAL is capable of analysing the largest Basic program However, with only 4K of RAM to run in, C64PANAL will run slowly analysing large Basic programs because many garbage collections will be done to ensure that there is sufficient space for C64PANAL to operate correctly Also, only 50 variables can be displayed because of space constraints

Obviously if C64PANAL is to run in the RAM at 49152 then some changes need to be made to Basic pointers in low storage The start of Basic and end of Basic addresses need to be changed as well as the start of variables etc These changes are handled by the C64PANAL loader program LOADER is the Basic loader program which automatically loads C64PANAL It sets the low storage pointers, and then uses the dynamic key facility to automatically load C64PANAL

You must create and save LOADER first on tape or disk. Next type in C64PANAL and save it directly after LOADER on tape or on the same disk as C64PANAL

Note that if you are using disk you need to change line no 10 in LOADER from LOAD "C64PANAL", 1,1 to LOAD"C64PANAL", 8,1 so that C64PANAL will be loaded from disk and not tape

Once you have saved LOADER and C64PANAL to tape or disk then simply load LOADER and RUN it LOADER will set the various low storage pointers and then set up the screen and keyboard buffer so that when it ends, C64PANAL is automatically loaded at 49152 When C64PANAL has been loaded it begins execution automatically, clears the screen and places the first message on the screen

LOAD FROM DISK (Y/N)?

If you want C64PANAL to load the Basic program it analyses from disk, then reply Y Otherwise reply N and the program will be loaded from tape Before replying to this message, you should have the tape or disk which contains the program to be analysed in the datasette or disk drive

The next message to be displayed is

PROGRAM TO BE LOADED = = ?
Your answer to this message tells C64PANAL the name of the program it is to load from tape or disk to analyse

C64PANAL then uses the KERNAL load subroutine to load the Basic program at 2049 and begins to analyse it Since it may take some time to analyse large Basic programs, C64PANAL places the line number being analysed in the top left-hand corner of the screen while scanning the Basic program When analysing is finished the summary report is displayed as follows

—PROGRAM STATISTICS—
PROGRAM NAME = C64PANAL
PROGRAM SIZE = xxxxx
NO OF LINES = xxxxx
NO OF COMMANDS = xxxxx
NO OF VARIABLES = xxx

USE ANY KEY TO CONTINUE

You may view the summary report for as long as you wish To move to the command report, simply use any key and the following display appears on screen

- COMMANDS -	
END	=1
FOR	= 5
NEXT	= 6
DATA	=10
INPUT	=1
READ	=1
GOTO	=25
IF	=30
GOSUB	=17
RETURN	= 17
REM	=8
POKE	=5
PRINT	= 38
THEN	=25
+	=45
-	= 15
*	= 51
/	= 19
AND	= 1
=	= 55
MID$	= 3

USE ANY KEY TO CONTINUE

If all commands used in the progam can be displayed on one screen, then when you press any key you will move to the VARIABLE display If more commands are used than can be displayed on one screen then the next screen of data will contain command data When the last of the command data has been displayed and the USE ANY KEY message is displayed, when you press any key the list of variables appears on the screen Note that + - * / = < and > are considered commands when used in statements such as A=A+B*C D/E of IF X 0 GOTO 1000

When the commands are finished, the list of variables is displayed as showo

- VARIABLES -

I	= 2
X	= 4
RR$	= 5
Z	= 3
ZZ%	= 9

USE ANY KEY TO CONTINUE

When the last of thevariables has been listed, C64PANAL displays the following message

R = RE-DISPLAY, X = END, P PRINTER

If you press the R key, then all information beginning with the summary display is reshown If you press the X key then program execution is terminated and the final time message is displayed

TIME TAKEN = xxxx xx
This is the time in seconds it has taken C64PANAL to analyse your program
You may then use C64PANAL to analyse another Basic program
Press P and the information is sent to the printer.

Applying C64PANAL

C64PANAL has many uses You can find the size of your Basic program, the number of variables you use and the number of lines in your program The number of lines is important, because each line in a Basic program carries an overhead of 4 bytes (2 bytes for a link address and 2 bytes for the line number) A 500 line program uses 2,000 bytes of storage for link addresses and line numbers If you have an excessive number of lines, you can conserve space by reducing the number of lines (also known as crunching your program) You reduce the number of lines by placing multiple commands on the same line seperated by colons removing blanks and removing REM commands

Processing new lines also carries with it a performance penalty The more lines in a Basic program, the longer it normally takes to run By reducing the number of lines, you normally reduce program execution time C64PANAL will tell you how successful you have been at reducing the number of lines in your program It will give the size of your program and the number of lines before crunching, and then after you have made your changes you can run it again and get the new figures

The detailed list of commands (ie PRINT's, GOTO's, IF's etc) can also be used to reduce program size and increase performance For instance, if you find that you have a very large number of IF commands, then you may be able to reduce them by using the ON command For example if you have

IF CC = 1 GOTO 1000
IF CC = 2 GOTO 1100
IF CC = 3 GOTO 1200
IF CC = 4 GOTO 2000
IF CC = 5 GOTO 2100
IF CC = 6 GOTO 2200

then you could replace the IF commands with one

ON CC GOTO 1000, 1100, 1200, 2000, 2100, 2200

It is also interesting to see the pattern of commands in various programs and which commands are used most frequently In string operations the LEFT$, RIGHT$ MID$ etc will figure prominently However, the most common commands used are the IF, GOTO FOR and NEXT and PRINT

The list of variables is a powerful tool to help in the execution of your Basic program Basic maintains a list of variables, and the closer a variable is to the start of that list, the less time that is needed to find the variable when it is refereneed in a statement For example, every time IF X = 3 7 TOTO 100 is executed, the X variable must be found in Basic's list of variables to check if it is 3 7 or not. Thus the closer X is to the top of the list the faster it is found The order of variables makes a significant difference to the execution time of your program if you have a large number of them C64PANAL helps by giving you a guide as to which variables ought to be defined first so that they appear at the top of Basic's list of variables You can ensure the order of variables by defining them in the following aaner

X = 0 A = 0 Y = 0 PC = 0 TK% = 0 etc

X will come first, A second, Y third in the list and so on

If you have Basic programs where execution time is crucial (for eg. games programs) then C64PANAL will be an important tool to help you analyse those programs and make them faster

COMMODORE 64 SWITCH

Commodore 64 SWITCH is a short Machine Language (ML) program which resides in RAM just before the BASIC ROM It occupies storage locations 40704 to 40959 C64 SWITCH allows you to partition your C64 into two logical machines You switch between the two partitions or regions with a single key stroke With this utility, you can load two Basic programs at once and compare them or work on them However, you cannot have both programs running simultaneously

Using C64 SWITCH

C64 SWITCH allows you to set variable region sizes The regions are designated zero (0) and one (1) and region 0 will extend from location 2049 to the limit your set, while region 1 extends from the end of region 0 to 40703

To use the switching function, simply load SWITCH which is a Basic loader program When you run it, SWITCH will load the ML routine at 40704 and display the message

ENTER REGION 0 ENDING ADDR >?

You enter the ending address for region 0 (and thus region 1 starting addr) and the final messages are displayed

REGIONS 0 and 1 INITIALISED
REGION ACTIVATED = 0

To switch between the two regions use the F1 /F7 keys F1 will activate region 0 while F7 will activate region 1 The active region is displayed in the upper right-hand corner of the screen in reverse video To deactivate the SWITCH, simply hit RUN STOP RESTORE or turn the C64 off and on

Applying SWITCH

C64 SWITCH has three main uses You can load two Basic programs at once and work on them or compare them You can use region 1 as a data region which is accessed by a program in region 0 (SWITCH was originally written for this purpose) Finally you can use SWITCH as a means of merging two programs If you want to add code to a program in region 0 from a program in region 1, simply LIST the statements in region 1 on the screen, press F1 to activate region 0 and then move the cursor over the lines you want added and press RETURN Each line will be entered into the program in region 0

Help!

Enhance your help function with this handy utility

By Mark Everingham

In the old Commodore advertisement (you know, the four page epic which managed to link Charles Babbage, an elephant, and a teddy-bear called BJ to buying a Commodore computer for Christmas), special emphasis was laid on the 'HELP' function of the C16 and Plus/4 computers. Commodore claimed it helps you to debug your programs, yet I have owned a Plus/4 for several months now, and can honestly say I have never used the HELP function except for the novelty. The BBC Micro has a command *HELP which lists the syntax of a given command on a sideways ROM, and I decided to implement such a function on the Plus/4. I decided on three features it should have –

1. It should be compatible with the Commodore C16.

2. It should not take any memory from the programmer.

3. It should not interfere with the normal HELP function.

A tall order? Well, I decided that to allow a reasonable amount of help on the C16, the program must use the Disk Drive. That way, I could put it in the cassette buffer so as not to use up any memory, and a CHRGET wedge like the DOS SUPPORT program seemed appropriate to allow for the normal HELP function. The result is a 142 Byte piece of machine code using standard PRG files on a Commodore Disk Drive such as the 1551!

The Programs

Listing 1 is a short and sweet Screen Editor I wrote to produce HELP screens and store them on Disk.

Listing 2 is the Basic Loader program for the HELP command. It Pokes all the code into memory and redefines the function keys.

Listing 1 - The Screen Editor

When you've entered and debugged the program, save it onto a disk using DSAVE 'HELP EDITOR' and RUN the program again. You should be presented with a white screen showing the usual flashing cursor in the top-left corner. At this stage, the editor acts just as if you were editing a document - type text, in normal or reverse, graphics symbols, anything you want, even use the ESC functions to format your screen.

Pressing RETURN from the first level puts you into the command mode. A bar will appear at the bottom of the screen with three options. Press the relevant function key to select each one.

LOAD prompts for a filename and attempts to load this HELP screen from the disk.

SAVE prompts for a filename and saves the current screen to disk under that name.

CONT puts you back into level – the edit mode.

When you've created a help screen, save it onto Disk under a suitable and memorable name, and exit the program. The HELP command now has something to work with. If you DIRECTORY the disk, you will see a file filename H' The ' H' designates a HELP file.

Listing 2 - The Basic Loader

Now that you have some data on disk type in Listing 2, the Basic Loader, and save it on disk using OSAVE 'HELP PROGRAM'. When you have run it, try pressing function key 1. You should see the message 'SYS 933:REM ON'. SYS 933 turns the HELP command on, press function key 2 or type SYS 950 to turn it off.

With the HELP Command on, try typing in HELP (RETURN). This

simply does the normal HELP function if your program has no errors in it, nothing should happen Now, try typing HELP Filename, where filename is the name you stored your Help screen under If all is well your screen should load and the READY prompt will appear at the bottom of the screen If this does not happen something is wrong if you get an error message "?STRING TOO LONG ERROR this means that you have tried to type in a name more than 14 characters long If you get the error message "?DIRECT MODE ONLY ERROR then you have tried to use the new HELP command from within a program If neither of these, use PRINT DS$ to find the error The Syntax and errors returned by the HELP command are shown below

Syntax of the HELP Command

HELP (RETURN) Normal HELP function

HELP (Filename) Loads help file called 'Filename' from disk

SYS 933 Turns HELP Command On

SYS 950 Turns HELP Command Off

Errors returned by the HELP Command

All DOS Errors a fault concerning the disk

?STRING TOO LONG You have typed a filename longer than 14 Characters

?DIRECT MODE ONLY You have tried to use HELP in a program

Information on the HELP Program

The HELP Command resides by default in the first 142 bytes of the cassette buffer ($332-$3BF) Note that when it is installed in this area of memory the program will be erased by pressing 'RESET' I placed it here to avoid clashes between the Plus/4 and the C16 However it may be relocated by changing the address A in line 0 of the BASIC Loader Program

Practical use of the HELP Command

When creating HELP files try to give them memorable and unambiguous names It is also a good idea to make them short, though the '*' and '?' designators may be used in filenames For instance, if you are going to replace the manual with a HELP disk, divide the files into commands, each showing the syntax and a few examples of the command's use E g Typing HELP 'CIRCLE' might bring up all the different ways of using the command CIRCLE The thing of utmost importance is to 'use your common sense!' Its a system which is very powerful when used properly, but could end up not being helpful at all if help files are designed without thinking Anyway, I hope it will be very useful to you!

GAMES UPDATE

Super Cycle

The budget bonanza continues with this classic bike racing game that topped the charts in its full-priced format. Myriad Courses wait to test man and machine

Arcade

Touchline:
Title. Super C
Holford Way, H
356 338. Price: £2.9

The Deep

If you tried to imagine what a game called *The Deep* would be like, you'd probably think of buried wrecks, sharks, octopuses or perhaps submarines. You certainly wouldn't think that you'd spend most of the game on the

This is exactly what you do

arcade game which I think , in which you controlled a that had to survive an assault and fired torpedoes at

oy subs, after which om to the surface, ge to avoid a helicopter ut catch game by skim

There are three

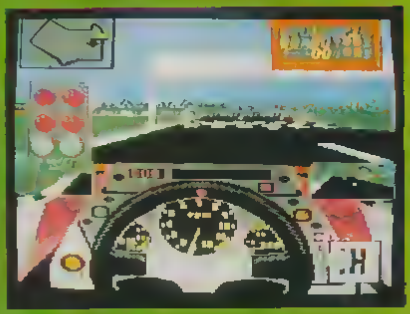
destroy a giant

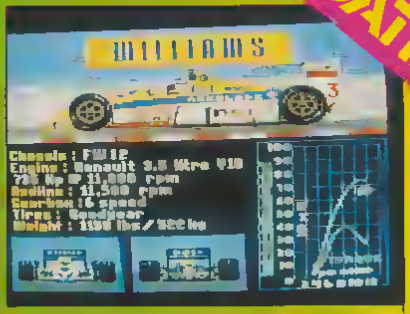
fleet of escaping

that are being

game again

Touch
Title





GRAND PRIX CIRCUIT

Despite the split between Electronic Arts and Accolade the string of Accolade imports continues from the EA stable. This latest one attempts to recreate the world of Formula 1 racing and offers you the chance to drive for either the Ferrari, Williams or Mclaren teams in a world championship against nine other drivers and over eight Grand Prix races.

Selecting the team you will drive for also selects the type of car you will drive – for example, the Ferrari is slower than the others, but is not as likely to spin and so is a good car to start with. When you think you can control the car, you may want to swap to a Williams or the fastest, the McLaren. A more detailed appraisal of each car is presented on-screen in a display that shows the power curves or horse power and torque, engine size, gear box, chassis and weight, so that people who think these figures are important can use them to decide which car to use in the championship.

Perhaps of more importance is the game level you choose to play at, as this can determine whether it will be a quiet sporting race without any mechanical problems, or a bitter fight where the best car and driver will win. The problem with the car is keeping it going at a speed fast enough to maintain your race position, but slow enough to stop it from blowing up.

Tyres are also a major headache, particularly in the longer Grand Prix where cornering too quickly and spinning can cause excess wear. They can be changed in the Pits, but this can cost you valuable seconds if your Pit team isn't quick enough.

The first Grand Prix of the season is at Rio de Janeiro in Brazil, but before you can think about the nine championship points for winning it, you have to drive round the circuit in a qualifying lap. This not only gives you a preview of the track, but the time you take decides your position on the starting grid.

The race screen display shows your view of the track and your controls, which include a tachometer to watch for engine strain, a damage indicator that plots the condition of your car, especially braking and handling, a speedometer, rear view mirrors to check that no one's in your slipstream, and a map box that includes a line drawing of the course and a flashing dot to plot your position.

Steering can be a little tricky at first, as moving the joystick turns the wheel and you must remember to turn it back again as it doesn't auto-centre, unlike most driving games. However, once you've mastered the basics you have to contend with the competition, particularly at the higher game levels when any collision will put you out of the race.

The corners are the best place to overtake, where the driver with the strongest nerve will take the lead – it's all down to when you apply the brakes. If you brake after your opponent, you'll go round the bend in the lead, but if you leave it too late you'll spin off.

While *Grand Prix Circuit* is a good simulation of a formula 1 championship, an eight race season will probably prove too much for all but dedicated formula 1 fans. There is an option to race in a single Grand Prix, but there are better racing games for the casual driver. This one's for those who live on carbon monoxide car fumes.

Touchline

Title *Grand Prix Racing* ***Supplier*** *Accolade (Electronic Arts) Langley Business Centre, 11-49 Station Rd, Langley, Berks, SL3 8YN* ***Tel*** *(0753) 49442*

Infiltrator

Here's a second chance to fill the ample boots of the one and only Johnny "Jimbo Baby" McGibbets as he flies off in his Wuzzbang Enterprises Gizmo chopper to save the world at least three times. The former full-priced game has been re-released via the Kixxs label, and it's excellent value for money.

His opponent in all this is the aptly described but unnamed Mad Leader who is threatening all sorts of [illegible] things if he isn't stopped, and Jumbo Baby" the [illegible] ob

[illegible] ct [illegible] ions follows [illegible] ni a pati n a [illegible] as stage game n which you must fly through [illegible] nemy airspace to [illegible] ind the Mad Leader's camp, then (on foot) infiltrate the heavily armed camp and search the buildings for secret plans weapons and so on.

In fact *Infiltrator* is three games in one, starting with a combat flight simulator in which you must combine stealth to confuse the enemy with fighting skills to shoot them down. In the camp you are armed with false papers and sleeping gas to get into the camp without raising the alarm. Inside the buildings things get tougher as you must avoid the guards and search (*Impossible Mission* style) every object in every room. If the guards get too nosey, showing them your papers may satisfy them; if not, use some sleeping gas and then get out before the come round and raise the alarm.

Infiltrator was a smash hit in the States, but is still underrated over here. At £2.99 it's a bargain.

Touchline

Title *Infiltrator* ***Supplier*** *Kixx (US Gold)* ***Units*** *2/3 Holford Way, Holford, Birmingham B6 7AX* ***Tel*** *021 356 3388* ***Price*** *£2.99*

This is the re-release of the conversion of the original arcade game that began the craze for car shoot-em-ups that has resulted in a string of games including *Road Blasters* and *LED Storm*. It all started in 1983 with *Spy Hunter*.

Naturally, it looks a little dated with its top-down view of a scrolling road network that you must patrol, but the gameplay is just as addictive, and has certainly stood the test of time.

The action begins as the weapons van pulls up at the side of the road and the Spy car rolls out into your joystick control and begins with a machine gun as its only weapon. Your mission is to stay alive as long as possible (oddly enough) and clear the road of the villains. Road Lords, Armed Dumpers, Enforcers, Switch Blades, and Mad Bombers (helicopters).

[illegible] villains attack you [illegible] weaponry, [illegible] on [illegible]

DENARIS

Denaris is a planet with a problem For years its scientists have been developing super-advanced machines and so it was almost inevitable that one day the machines would get so advanced that they wouldn t need the men any more

By the time the Denarians realised what had happened, it was too late to launch a direct assault They tried anyway, but it just made the machines more powerful Their only chance to break the tyranny and escape from their underground prison is you, flying a small fighter

The fighter is, of course, highly manouverable and can be improved by collecting items and debris from enemy ships Before you start thinking that you've heard it all before, and that this is just another *Nemesis* clone, I'm delighted to tell you that it isn't [illegible] thing, two of you can [illegible] together.

[illegible] as a DS-H75 [illegible] for the [illegible]

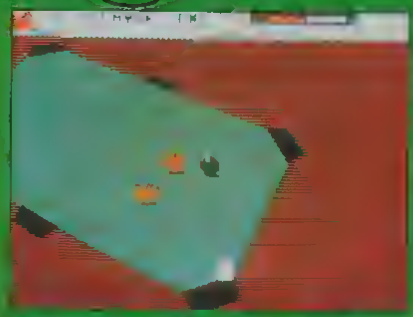
the firepower of the satellite and the Zeela stars increasing and decreasing the speed of the alien ships

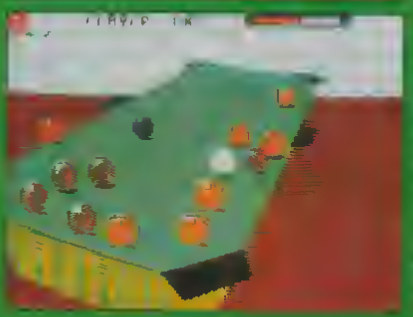
There are five types of balls that add a cumulative effect on your ship they include a red ball to increase shooting power, green to add to the number of missiles, blue to activate a temporary shield, grey to add 1000 bonus points and yellow, which acts as a smart bomb destroying everything currently on the screen

Extra weapon symbols are less common, and include systems known as the Scatter Shot, Lightening Blitz Shot and Power Shot You can also collect protection satellites that fly above and below your fighter and deflect incoming missiles You will need all this firepower and protection if you are to survive the level, as well as the inevitable monster machine that guards the way to the next screen

[illegible] learn to control [illegible] an auto- [illegible] you [illegible] button to

3D Pool





Bargain Bucket!

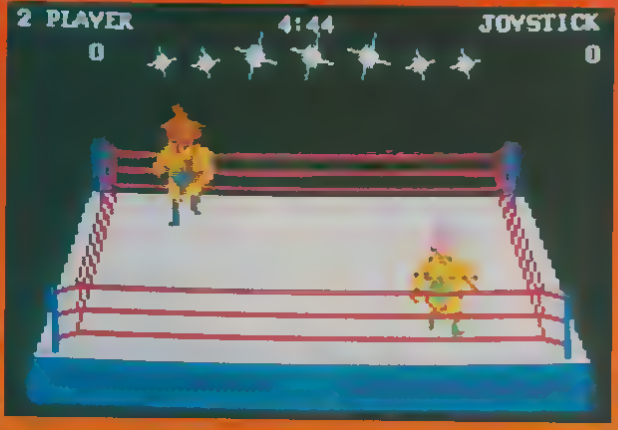
Six new budget games of varying quality are given the once over by **Gordon Hamlett**

Four titles this month offering six different games, so everybody should be able to find something to suit both pocket and taste.

Missing Omega from Bug Byte sees you trying to explore and deactivate an alien object – Omega. The problem is, you only have one hour of real time to accomplish this. There are four different reactors that need to be shut down in this period in order to ensure the safety of life, the universe and everything.

You start off by designing your own robots, each made up of four different components – base, weapon, sensor and power. You must then explore Omega, controlling your robot either manually, on automatic or by programming it.

This is an intriguing game, but it's let down somewhat by an inadequate set of instructions so that even after prolonged playing I still had little idea of what exactly I was trying to accomplish.



DING! ROUND 2

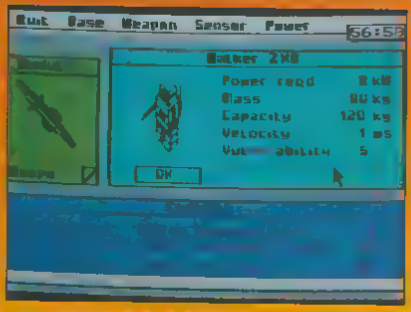
The other two games are similar in that both are derivatives of arcade games. *BMX Kids* has you trying to qualify for the next race by finishing in the top three in your current race. It's not sufficient just to complete the course you have to perform stunts and tricks as well. Collect cans of pop to boost your energy and wheels to repair the damage caused by collisions with the other riders.

The final game is *Ninja Master* which is a truly dreadful martial arts game but one so bad that it's almost worth having for that fact alone. Dodge arrows, karate chop logs, fend off death stars with your sword and finally shoot down cannisters with your blow pipe if you can muster enough interest.

Pi R Squared also from Bug Byte is a strange game. You must chase round cogs trying to pick up the different elements of assorted mathematical formulae. Pursuing you round the perimeter of the cogs are the chasers. Contact with these decreases your IQ although you can restore this by collecting books. Other objects may be beneficial or hazardous to your journey. I didn't particularly enjoy this game first time round and I'm afraid that time has not mellowed my opinion.

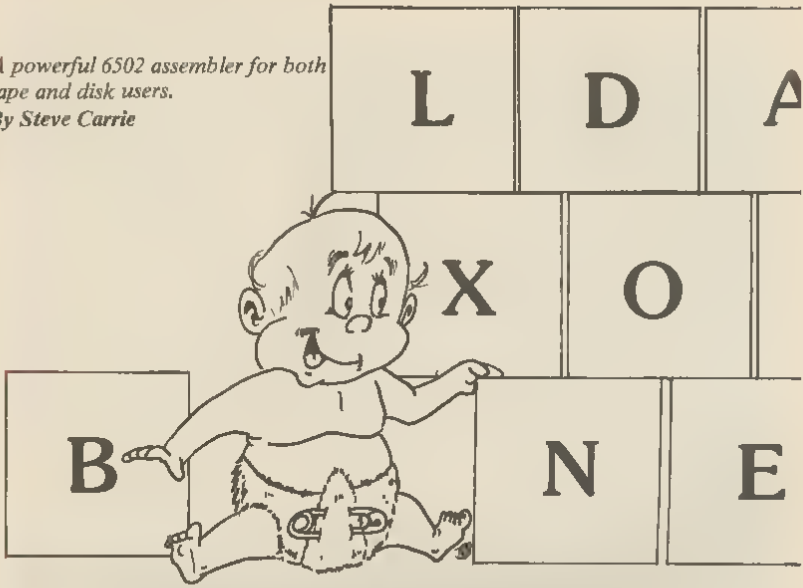
The final game this month, and by far the best of the bunch is *Dan Dare II* on Mastertronic's Ricochet label. Perhaps the most notable aspect of this sequel is that it is actually different from the original — something most unusual in this industry. The evil Mekon has developed a race of Supertreens and it's up to Dan to penetrate the four levels of the Mekon's ship and sabotage the control boxes.

You can also choose to play the Mekon attempting to release the Supertreen into outer space. In either case you only have a limited amount of time to accomplish your task before moving onto the next level. This is a good-looking game that plays exceptionally well, and if you don't already have it in your collection I suggest that you go out and pick up a copy straight away.



Bargain Bucket!

A powerful 6502 assembler for both tape and disk users.
By Steve Carrie



The ASM Assembler

The ASM assembler is a dual mode system whereby 6502 assembly language programs may be compiled from either one or more disk files and/or memory It provides a set of commands to control its various functions and also allows output to a Commodore printer

The system has two modes of operation, disk mode and memory mode In disk mode, the source code file is read from the source disk drive, and its compiled output sent to another file on the destination disk drive In memory mode the source code is read from memory (where it is edited in either mode) and output to memory Code relocation facilities exist to allow a program to be assembled to run at one address but placed at another

The ASM system has two error modes, fatal and nonfatal In fatal mode, an error will cause the assembler to halt, whereas in nonfatal mode, the assembler will process the whole file, listing errors as it goes Some facilities also exist for control of disk drives and errors reporting from these devices A printer re-direction facility allows all output which is normally sent to the screen to be sent to the printer at device number 4 or 5 Source and destination drive numbers may be set before assembly commences Whilst using the editor, any Basic direct mode command may be issued

Whilst ASM was designed primarily for use with disk drives the fact that it supports memory assembly allows tape users to make use of it The memory mode was originally designed to allow short routines to be tested without having to resort to disk usage Even in memory mode, you may still make use of files from disk as the file-link/file-include facility still works

Getting it all in

Listed here as a Basic loader program, ASM represents a considerable typing task You may type in the program directly as it stands, **but don't run it until you have read the next bit!** Before running, (assuming you have saved a copy to tape disk first) execute these direct BASIC commands first These will set the memory configuration correctly

POKE 43, 01 POKE 44, 35 POKE 8960,0 NEW

Now reload the Basic loader and run it. ASM will be POKEd into memory at the correct address and saved to whichever device you set the device no. to (1 or 8 9 10/11 see the listing). Reset the machine and load and run ASM. You should get a sign-on message and a flashing cursor.

When ASM is loaded and run, it installs a small wedge into the BASIC system. This has two important effects:

(1) Edited program lines are no longer tokenised by Basic. This means that you cannot edit a Basic program. This is similar to the EDIT program in my 'Constructing a Compiler' series in a previous issue of *Your Commodore*.

(2) A set of additional commands are introduced via the special character *. These commands allow you to easily access the facilities provided.

The additional commands

The extra commands are as follows:

Assembly

***asem:** Start the assembler in the mode set by the mode commands *mem and *disk. The operation is as follows. In disk mode, you are asked for a filename whose default extension is asm. The output file will have extension exe. In memory mode, the source code is expected from memory and output is to memory. During assembly, output of messages, listings, etc to the list device will follow the mode set by commands *prnton and *prntoff whilst the treatment of errors will be defined by *fatal and *nonfatal. Assembly may be halted at any time by pressing the RUN/STOP key.

Assembler control commands

***disk:** Sets assembler disk mode. Source code is expected from disk and output is to a disk file (see *asem).

***mem:** Sets assembler memory mode. Source code is expected in memory and output is to memory.

***fatal:** If an error is encountered during assembly, the assembler will stop.

***nonfatal.** If an error is encountered during assembly, it is displayed but assembly continues with the next line of source code. Note that output is still produced in this mode but it should be noted that the program may not run correctly.

Information and editing commands

***renum:** Renumber a source program in memory starting at 10 and going up in steps of 10.

***symbols:** Display the symbols listing from the last assembly operation.

***show:** Show the mode of operation. This will show the assembly error and list device modes as well as device selections.

***help:** Lists all the available commands.

***reset.** Set the ASM system to default startup mode. All values are set to default states i.e. printer off, fatal error mode, memory assembly.

***info:** Display assembly information from last assembly operation.

***scat:** Display source device directory.

***dcat.** Display destination device directory.

Device control commands

***source:** Sets source device. Argument is the device number which must be in range 8 to 11.

***dest:** Sets destination device. Argument is the device number which must be in range 8 to 11.

***scmd:** Send a command to source device. The command must be in quotes e.g. *scmd "u0 disk1,dl" will format a disk.

***dcmd:** Same as *scmd but for the destination device.

***serr:** Display device error for source device.

***derr:** Display device error for destination device.

***prnton:** Enable printer output. Argument is the select code for the list device (4 or 5).

***printoff:** Disable printer output.

Note that certain functions such as listings are controlled from within a source program, e.g. sym, lst (see directives).

Available Operators.

The following are valid in an expression.

$	Hex value e.g. sta $C000
'	Ascii value must be two e.g. lda #'a'
<	Low byte, e.g. ldx #<symbol
>	High byte e.g. ldy #>symbol
+	Addition e.g. symbol eqa another+2
-	Subtraction e.g. symbol eqa another-6

Errors and their meanings

The following is a list of the various error messages which may be printed during assembly.

Undefined Symbol Error

This occurs if a symbol has been referenced but has not been defined.

Redefined Symbol Error:

Occurs when a symbol is defined more than once.

Mnemonic Not Recognised

What the assembler took to be a mnemonic does not appear to be a valid one.

Bad Symbol Error

Something is wrong with a symbol. Typically an invalid character or it is too long.

Illegal Operand Field

Illegal Mnemonic Field

These two errors point to a general syntax problem in a source code line.

Missing Operand Error:

An operand was expected but was not found.

Disk File Error:

General failure of disk system.

Syntax Error

A problem with a directive is likely.

Illegal Quantity Error:

Some overrange condition has occurred, typically a 16-bit value in a byte mode instruction.

Illegal Addressing Mode:

An instruction was used in an incorrect way.

Not X or Y Index

Only X and Y index registers are valid.

Symbol Table Full:

Pretty fatal one this. It indicates that the space set aside for symbols has been exceeded.

Branch Range Error:

Branch instructions are relative and may only operate within a certain range.

Linkfile name length error:

The argument to an lnk directive is too long.

Linkfile name missing

The argument isn't there at all!

Bad directive in memory mode

You have used some directive not valid in memory mode.

Bad directive in disk mode:

You have used some directive not valid in disk mode.

Cannot open another linkfile.

Trapping error message when you try to link another file whilst already linked.

No such select code for this device

You have tried to assign a device

```
[illegible]
[illegible]

[illegible]
5H i-l
60
70 .ifd#  eqz ##1
80 .chr# eqz inde+#
90 .screen eqa $0400
100 ;
110 lda #<screen
120 ldx #>screen
130 sta inde<
140 st  inde<+1
150 ld  #5
160 ld  #0
170 ldy #0
180 .+ill sta (inde<),
190 de
200 bne fill
210 inc inde<+1
220 dex
230 bne fill
240 rts
250

ready.


10 ; Example E
20   Usec Ink +ile
'VAR ASM'
30   use in memeor' or
disk mode
40
50 or3 $c000
60 lst
70 ;
80 lnk "var.asm"
90 ;
100 lda #15
110 ld  #6
120 sta vic+$21
130 st  vic+$20
140 rts
150 ;

load".

Type This In And Save to disk
10   Module "AF.ASM
20 ; Equate for Example E
30 ;
40 .vic eqa $d000

ready.
```

code other than 4 or 5 for a printer (*printoo) or a code rather than 8, 9, 10 or 11 for a disk drive (*source; *dest) Occurs in editor mode only

Device Communication Failure.

Communication to a disk drive failed May indicate wrong device number Equivalent to Basic's "Device Not Present" error

Things to look out for...

When ASM is installed and running, the following information is relevant The Basic chrget code is diverted to a new routine within the ASM code to allow the inclusion of the new commands The program loads like a Basic program into memory starting at address $0801 When it has been run the start of Basic is shifted up to about $2500 You may still type any Basic direct command such as LOAD, SAVE, POKE, etc but caution is advised using POKE on addresses between $0801 and $2500

In both memory and disk modes, code is edited above about $2500 In memory mode, the symbol table begins in memory after the source program This also applies in disk mode hence any program in memory will be preserved This means that you should type 'new' before commencing a disk mode assembly to maximise symbol space During assembly, the BASIC ROM is switched out The space from $C000 to $CFFF is left free Symbols thus occupy the space from the end of any program in memory up to $BFFF

ASM should co-exist peacefully with the Basic interpreter The *reset command may be used to resolve certain situations where the system is not operating correctly However it has a limited effect, and it may become necessary to powerdown should the system still operate incorrectly

ASM is source code compatible with my earlier FCL system assembler published in a previous *Your Commodore* and also my PLUS4 assembler ASM's facilities are in effect, a superset of the FCL assembler's facilities and ASM could therefore replace the FCL assembler if desired

To help you become familiar with the system, I have included some example source files/listing which may be assembled using ASM The comment fields at the beginning indicate which mode they should be run in Good luck!

DMA Assembler Directives

BYT *Byte value directive Single values or strings in single quotes values*
e g byt 32 64, $93, cbm64", 0

WOR *Word directive*
e g wor $C000 $D01A, S3248

EQZ *Zero page equate Used to assign a zeropage value to a symbol*
e g pointer eqz $FB

EQA *Absolute equate Used to assign an absolute value to a symbol*
e g vic eqa $D000

ORG *Set code origin. In disk mode also sets code load address.*
e g org $C01A

RES *Reserve memory*
e g res 60 (reserve 60 bytes)

LST *Causes assembler to list during pass 2*

SYM *Causes assembler to display symbols upon completion of the assembly*

LNK *Chain to another file When file has been assembled the current file resumes assembling*
e g lnk "symbols asm'

REL *Relocation offset The code origin is set by the org directive This directive allows you to assemble code to run at one address (org) whilst being sent to another memory area (rel)*
e g org $1000
rel $C000

Disk Edit

Delve further into your disks with the help of this article

By Fergal Moane

Disk editing is what separates a casual disk user from a professional. Once you can edit disks, a whole world of seemingly impossible tasks becomes possible. Files can be locked, unscratched, closed, relocated, and renamed when you have the commands and the know-how.

Firstly, a word of warning: don't edit a disk with important programs on it, unless you know what you're doing. Use unwanted disks for practice, and take backups of valuable disks. A good Disk Editor will make things a lot easier: you have no need for complex commands. There is a good example in the December 1987 edition of *Your Commodore*. This is not essential though - you can make do with the commands and DISPLAY T&S on the demo disk you got with your drive.

Commands

The commands regarding direct disk access are called the Block commands (a Block is another name for a Sector)

Your disk drive manual contains more detailed explanations but a summary follows

To use these commands, you'll need to have two files open one for commands and the other to a buffer for data The command channel you will probably be familiar with

```
OPEN15,8 15
```

The data channel can be any other number but 5 or 2 are usually used

```
OPEN5 8 5 "#"
```

After these open commands PRINT 15 will send commands, and PRINT 5 will send data to the channel

Note that when drive is mentioned, this means 0 for a single drive The device is usually 8, but can be changed See the examples on the disk for more information

Block-Read

```
SYNTAX  PRINT #15  "B R"
                   channel,
                   drive,
                   track
                   sector
```

This command transfers the required sector into the data channel (in our case 5) Then use the GET 5 command to read the information into a variable

It's important to note that Block-Read will only read up as far as the Block-Pointer, which is usually 0 The USER1 command is usually used as this sets the pointer to 255 automatically allowing the sector to be read in one operation

USER1

```
SYNTAX  PRINT #15  "U1"
                   channel
                   drive,
                   track
                   sector,
```

Block-Write

```
SYNTAX  PRINT #15, B W
channel

drive

track

sector
```

To use this command, fill up the channel with information to write using PRINT 5 then use the command to write to the required sector This is the exact opposite of Block-Read so again USER2 is usually used

USER2

```
SYNTAX  PRINT 15  "U2"
channel,

                  drive
                  track
                  sector
```

Block-Pointer

```
SYNTAX  PRINT #15, "B-P",
                   channel,

                   location
```

By using this command you can specify where exactly in the sector you want the next read or write to begin This allows you to read or alter individual bytes in a sector, starting at 'location' See the Disk Name program for a demo

Block-Allocate

```
SYNTAX PRINT #15 "B A",drive

track

sector
```

This allocates a bit in the Block Availability Map to show a sector is in use It is used in connection with random access databases

Block-Free

```
SYNTAX PRINT  15 "B-F",drive,
                 track,

sector
```

This is the opposite of Block-Allocate and frees up sectors for use without destroying the actual data on them If a save is made, the data will probably be overwritten as the BAM has marked the sector as empty

Disk Maps

Before you can use these commands, you will need some information on disk structure The maps will provide this information and information on file structure

Editing

There are a number of files provided here for demonstration purposes The best way to learn is to study these programs with the maps close at hand They are heavily REMed, but here are some notes explaining what's going on Even if you don't learn anything, they are useful utilities to have

Protect File

This program 'locks' (i.e prevents it from being scratched) the first file on a disk by setting bit 6 of the file type to 1 effectively ORing it with $C0 This prevents accidental erasure and has a < beside its name in the directory By adding 32 to the last pointer number and changing the sector number any program in the directory may be protected

Disk Name

This allows you to change the name of the disk without erasing the contents It makes use of the fact that the disk name is stored at byte 144 track 18, sector 0

Load Address

This changes the load address of any program to a given address It searches for the first sector of storage and bytes 2+3 contain the load address It is most useful with sprite data

Unscratch

On scratching a file the filetype in the directory is merely marked as being deleted This program searches the disk for a scratched program and restores the filetype, resurrecting the file You are advised to save the unscratched program to another disk in case of another accident Note that this will probably not work if something has been saved to the disk since the SCRATCH, as it may have been saved over the old program Enjoy your disk editing!

BLOCK DISTRIBUTION BY TRACK

Track number	Block range	Total
1 to 17	0 to 20	21
18 to 24	0 to 18	19
25 to 30	0 to 17	18
31 to 35	0 to 16	17

1540/1541 BAM FORMAT

Track 18, Sector 0		
BYTE	CONTENTS	DEFINITION
0,1	18,01	Track and block of first directory block
2	65	ASCII character A indicating 4040 format
3	0	Null flag for future DOS use
4-143		Bit map of available blocks for tracks 1-35
		*1 = available block 0 = block not available (each bit represents one block)

1540/1541 DIRECTORY HEADER

Track 1B, Sector 0		
BYTE	CONTENTS	DEFINITION
144-161		Disk name with shifted spaces
162-163	160	Disk ID
164		Shifted space
165-166	50,65	ASCII representation for 2A which is DOS version and format type
166-167	160	Shifted spaces.
177-255	0	Nulls, not used
Note: ASCII characters may appear in locations 180 thru 191 on some diskettes		

SEQUENTIAL FORMAT

BYTE	DEFINITION
0-1	Track and block of next sequential data block.
2-256	265 bytes of data with carriage return as record terminators.

PROGRAM FILE FORMAT

BYTE	DEFINITION
0,1	Track and block of next block in program file
2-256	256 bytes of program info stored in CBM memory format (with key words tokenised) End of file is marked by three zero bytes.

RELATIVE FILE FORMAT

DATA BLOCK	
BYTE	DEFINITION
0,1	Track and block of next data block
2 256	254 bytes of data Empty records contain FF (all binary ones) in the first byte followed by 00 (binary all zeros) to the end of the record. Partially filled records are padded with nulls (00)
SIDE SECTOR BLOCK	
BYTE	DEFINITION
0-1	Track and block of next side sector block
2	Side sector number (0 5)
3	Record length
4-5	Track and block of first side sector (number 0)
6-7	Track and block of second side sector (number 1)
8-9	Track and block of third side sector (number 2)
10-11	Track and block of fourth side sector (number 3)
12-13	Track and block of fifth side sector (number 4)
14 15	Track and block of sixth side sector (number 5)
16-256	Track and block pointers to 120 data blocks

Listings

Help Program

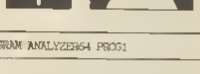
```
PROGRAM: HELP FP C64 (1987)

10 TRAP 110
20 IF S=0 THEN 210
30 IF C=1 THEN C=0 GOTO 160
40 FOR N=1 TO 3 KEY N CHR$(N) NEXT
50 SCNCLR POKE 2021 22 POKE 2022 0 :
   SYS 55693
60 POKE 2022 23 PRINT (CLR)(DOWN)
   TAB(13) (RVS) LOAD (OFF) (RVS) SAV
   E (OFF) (RVS) CONT (OFF)
70 GET K$ IF K$= THEN 70 ELSE K=A
   SC(K$)
80 IF K>3 THEN 70
90 ON K GOTO 140 160 50
100 GOTO 50
110 IF ER=4 THEN RESUME NEXT
120 PRINTCHR$(27) N? ERR$(ER) ERRO
   R IN EL
130 END
140 INPUT (CLR)LOAD FILE-NAME F$:
   IF LEN(F$)>14 THEN 140
150 C=1 LOAD (F$+ R ) R 1
160 IF DS<>0 THEN 50
170 PRINTDS$, GETKEY G$ GOTO 50
180 INPUT (CLR)SAVE FILE-NAME F$
   IF LEN(F$)>14 THEN 180
190 SYS 810 (F$+ R ) 8
200 GOTO 160
210 RESTORE FOR A=810 TO 850 READ
   D POKE A D S=S+A NEXT A IF S=27522
   THEN 40
220 PRINT ERROR IN DATA END
230 DATA 169 0 133 154 32 107 169
   169
240 DATA 0 133 200 169 10 133 201
   169
250 DATA 200 162 231 160 15 32 216
   255
260 DATA 76 251 168 144 3 76 125 1
   67 96
```

```
PROGRAM: HELP PROG LISTING2

10 RESTORE FOR L=1 TO 18 S=0
20 FOR N=0 TO 7 READ D$ D=DEC(D$)
30 POKE 810+L*8+N D S=S+D NEXT N
40 READ D$ IF S<>DEC(D$)THEN 80
50 NEXT L
55 KEY 8 HELP
60 KEY 2 SYS 950 REM OFF +CHR$(13
   )
70 KEY 1 SYS 933 REM ON +CHR$(13)
   END
80 PRINT ERROR IN LINE L*10+90 EN
   D
100 DATA A2 22 A5 9A F0 35 A9 00 3
   D1
110 DATA 85 9A A2 08 A0 83 20 BA 3
   46
120 DATA FF 20 64 03 98 A6 22 A4 3
   0A
130 DATA 23 20 8D FF A9 00 A2 08 3
   4A
140 DATA A0 0C 20 D5 FF 20 F0 A8 4
   A5
150 DATA 90 01 60 A2 16 A0 02 4C 7
   A
160 DATA F0 FF 20 48 9C C9 0F 90 4
   5E
170 DATA 05 A2 17 4C 03 66 A0 A9 3
   B4
180 DATA 2E 91 22 A9 48 C8 91 22 3
   4D
190 DATA C8 68 C9 EA F0 FA C9 3A 4
   D6
200 DATA 50 03 4C 93 04 4C 89 04 2
   4F
210 DATA A0 01 B1 3B F0 11 C9 3A 3
   91
220 DATA F0 0D E6 3B D0 02 E6 3C 4
   12
230 DATA 20 32 03 A9 0F D0 DF A9 3
   E5
240 DATA EA D0 D8 A9 09 8D AD 03 5
   34
250 DATA A2 03 BD 79 03 9D 84 04 3
   43
260 DATA CA D0 F7 60 A9 EC D0 ED 6
   13
270 DATA 4C 7C 03 C9 3A B0 00 00 2
   7E
```

Line Input

```
PROGRAM: LINE64 EAS

CC  10 I=51904
1D  20 READ A IF A=256 THEN 6000
    0
57  30 POKE I A I=I+1 GOTO 20
A8  51904 DATA 32 121 0 201 48 2
    08 11 32
9A  51912 DATA 115 0 201 133 248
    7 201 132
1B  51920 DATA 248 124 76 0 175
    216 56 32
56  51928 DATA 248 255 142 76 20
    3 140 76 203
01  51936 DATA 169 4 133 252 173
    176 203 133
CA  51944 DATA 251 162 48 24 173
    175 203 101
6C  51952 DATA 251 133 251 169 0
    101 252 133
A9  51960 DATA 252 202 208 248 3
    2 207 255 32
79  51968 DATA 36 203 192 0 208
    6 32 115
8F  51976 DATA 0 76 121 203 169
    0 56 177
83  51984 DATA 251 32 57 203 153
    61 3 200
CB  51992 DATA 169 0 3 144 3 76 0 2
    03 208
EF  52000 DATA 76 14 203 173 77
    203 177 251
6D  52008 DATA 41 127 201 32 208
    6 136 240
93  52016 DATA 4 76 36 203 208 1
    40 56 3
    52024 DATA 96 48 167 56 233
    32 144 8
6B  52032 DATA 201 64 144 4 24 1
    05 32 96
AE  52040 DATA 165 64 48 0 3 76
    60 115
D4  52048 DATA 0 96 167 201 32 0
    56 174 166
EE  52056 DATA 20 32 198 255 160
    0 32 16
DE  52064 DATA 235 201 13 240 14
    200 153 63 0
4A  52072 DATA 3 165 144 201 64
    240 5a 192
0A  52080 DATA 128 208 235 140 6
    0 3 32 121
AA  52088 DATA 0 32 138 176 139
    73 132 74
0B  52096 DATA 32 163 182 173 60
    3 32 117
F6  52104 DATA 180 169 2 165 97
    8 145 73
C6  52112 DATA 136 16 248 172 60
    3 136 185
09  52120 DATA 61 3 145 58 136 1
    6 248 32
A9  52128 DATA 204 255 96 136 76
    115 203 32
2A  52136 DATA 138 173 78 247 18
    3 0 256
3F  60000 FI$= LINE EXE
1F  60010 DE=0
0C  60020 POKE194 (51904/256), PO
    KE193 51904 (PEEK(194)*256)
21  60030 POKE175 (52142/256) PO
    KE174 52142 (PEEK(175)*256)
6B  60040 L=LEN(FI$)
30  60050 FOR1=1TOL POKE1023+1 A
    SC(MID$(FI$ I 1), NEXT
A5  60060 POKE187 9 POKE186 4 PO
    KE183 L POKE186 DE SYS62954
```

Analyser



```
PROGRAM: ANALYZER64 PROG1

72  10 GOSUB500 CLR REM SET LOAD
    ADDR
E6  15 GOSUB550      REM SETUP VA
    RIABLES
20  20 GOSUB700      REM LOAD THE
    ANALYSER
44  30 GOSUB550      REM RELOCATE
    ON SETUP
12  40
5C  50 REM  CHR OF CODES FOR REL
    OCATION
06  60
8F  70 IFCA>EATHENPRINT RELOCATI
    ON OK  GOTO150
DF  80 I=PEEK(CA) IFOC(I)=0THENP
    RINT INVALID OP-CODE  END
58  90 IFOC(I)=1THENCA=CA+1 GOTO
    70
FE  100 IFOC(I)=2THENCA=CA+2 GOT
    O70
```

```
B9  110 AD=PEEK(CA+1)+PEEK(CA+2
    *256:IFADC=ASCRAD A=THENCA=A
    +3:GOTO7
 E  115 AD=AD-RF HB=INT(AD/256)
    LB=AD-HB*256
FA  120 POKECA+1 LB POKECA+2 HB
    CA=A+3 GOTO70
E2  130 PRINT (DOWN2 RIGHT)1  ST
    ART ANALYSER = SYS  LA
3B  160 PRINT (RIGHT)2  TO UP AN
    ALYSER = SYS  LA+3
71  170 PRINT (RIGHT)3  DISPLAY
    DATA[SPC]1= SYS  LA+6
4D  180 PRINT
3E  190 END
CF  500
6D  510 REM  RELOCATION SETUP
JH  520
DD  530 IFLA=38912THENCA=1 EA=0
    RETURN
A8  540 PRINT RELOCATING ANALYSE
    R
6D  550 CA=LA:EA=LA+1651 RF=3891
    2 CA
3A  560 PRINT BUILDING OP CODE T
    ABLE
3B  565 OC(100)=3 OC(105)=2 OC(9
    7)=2:OC(113)=2 OC(125)=3 OC(
    121)=3 OC(101)=2
87  567 OC(117)=2
3D  570 OC(45)=3 OC(41)=2 OC(33)
    =2 OC(49)=2 OC(61)=3 OC(57)=
    3 OC(37)=2 OC(53)=2
E4  580 OC(14)=3 OC(10)=1 OC(30)
    =3 OC(6)=3 OC(22)=2
3A  590 OC(144)=2 OC(176)=2 OC(2
    48)=2 OC(44)=3 OC(30)=2 OC(4
    6)=2 OC(208)=2
6E  600 OC(16)=2 OC(0)=1 OC(80)=
    2 OC(112)=2 OC(24)=1 OC(216)
    =1 OC(88)=1 OC(184)=1
C8  610 OC(205)=3 OC(201)=2 OC(1
    93)=2 OC(209)=2 OC(221)=3 OC
    (217)=3 OC(197)=2
BE  620 OC(213)=2 OC(236)=3 OC(2
    24)=2 OC(228)=2 OC(204)=3 OC
    (192)=2 OC(196)=2
D3  630 OC(206)=3 OC(222)=3 OC(1
    98)=2 OC(214)=2 OC(202)=1 OC
    (136)=1
64  640 OC(77)=3 OC(73)=2 OC(65)
    =2 OC(81)=2 OC(93)=3 OC(89)=
    3 OC(69)=2 OC(85)=2
2B  650 OC(238)=3 OC(254)=3 OC(2
    30)=2 OC(246)=2 OC(232)=1 OC
    (208)=1
FA  660 OC(76)=3 OC(108)=3 OC(32
    )=3 OC(173)=3 OC(189)=2 OC(1
    61)=2 OC(177)=2
2B  670 OC(109)=3 OC(185)=3 OC(1
    65)=2 OC(181)=2 OC(174)=3 OC
    (162)=2 OC(190)=2
9B  680 OC(166)=2 OC(182)=2 OC(1
    72)=3 OC(160)=2 OC(188)=3 OC
    (164)=2 OC(140)=2
61  690 OC(76)=3 OC(74)=1 OC(94)
    =3 OC(78)=2 OC(86)=2 OC(234)
    =1 OC(13)=3 OC(9)=2
D4  700 OC(1)=2 OC(17)=2 OC(29)=
    3 OC(25)=3:OC(5)=2 OC(21)=2
    OC(72)=1 OC(8)=1
B7  710 O(164)=1 OC(40)=1 OC(46
    )=3 OC(42)=1 OC(62)=3 OC(38)
    =2 OC(54)=2
6E  720 OC(110)=3 OC(106)=1 OC(1
    28)=3 OC(102)=2 OC(118)=2 OC
    (64)=1 OC(96)=1
D8  730 OC(237)=3 OC(233)=2 OC(2
    25)=2 OC(241)=2 OC(253)=3 OC
    (249)=3 OC(229)=2
5E  740 OC(245)=2:OC(56)=1 OC(24
    8)=1 OC(120)=1 OC(141)=3 OC(
    129)=2 OC(145)=2
5D  745 OC(157)=3 OC(153)=3 OC(1
    33)=2 OC(149)=2 OC(142)=3 OC
    (134)=2 OC(150)=2
BE  750 OC(140)=3 OC(132)=2 OC(1
    48)=2 OC(170)=1 OC(160)=1 OC
    (186)=1 OC(138)=1
C6  760 OC(154)=1 OC(152)=1
4E  770 PRINT STARTING RELOCATIO
    N
01  780 RETURN
19  800
A8  810 REM  LOAD THE ANALYSER
8D  820
EA  830 LA=PEEK(55)+PEEK(56)*256
    :
01  840 PRINT (CLR_DOWN) LOADING
     THE ANALYSER AT  LA
94  850 FORI=LATOLA+2047 READQ:P
    OKEI,Q:X=X+Q:NEXT
F   860 IFX<>244800THENPRINT LOA
    D FAILED  END
9A  870 PRINT LOAD OK  RETURN
ED  880
E5  890 REM  SETUP ANALYSER LOAD
     ADDR
A1  900
11  925 DIMOC(255):I=0 CA=0 AD=0
    LB=0 HB=0
9D  930 HA=PEEK(55)+PEEK(56)*256
    :HA=HA-2048
CB  940 HB=INT(HA/256):LB=HA-HB*
    256
1C  950 POKE51,LB:POKE52,HB:POKE
    55,LB:POKE56,HB:POKE643,LB:P
    OKE644,HB
AD  960 RETURN
F7  970
03  980 DIMOC(255):I=0 CA=0 AD=0
    LB=0 HB=0 A3=38912 A4=4095
    9 RETURN
5B  1000 DATA 76 0 152 76 27 152
     76 39 152 32 162 152 208 9
    32 166 152 32 196
98  1010 DATA 152 32 212 152 32
    223 152 96 32 162 152 240 3
    32 4 153 32 223
6F  1020 DATA 152 96 32 22 153 2
    48 3 32 48 152 96 32 96 157
    32 177 153 32
92  1030 DATA 231 153 32 5 154 3
    2 166 157 32 83 154 32 230 1
    54 32 255 154
87  1040 DATA 32 10 155 32 21 15
    5,32 243 157 32 212 154 32 1
    58 155 32 167
8A  1050 DATA 155 32 200 155 32
    243 157 32 209 155 32 32 158
     32 247 155 32
40  1060 DATA 228 155 32 32 158
    32 3 156 32 12 188 32 15 156
     32 221 189 32
9E  1070 DATA 135 158 32 33 171
    32 29 156 32 121 156 32 60 1
    57 248 197 32
2B  1080 DATA 64 157 32 96 157 3
    2 116 157 32 158 157 32 169
    157 32 108 157
DA  1090 DATA 32 237 157 96 173
    116 158 98 200 116 158 162 1
    173 0 3 141
E3  1100 DATA 117 158 173 9 3 15
    7 117 158 173 119 158 141 8
    3 189 119 158
C8  1110 DATA 141 9 3 96 155 160
     141 123 158 185 181 141 124
     158 185 162
BF  1120 DATA 141 125 158 96 185
     57 141 121 159 165 58 141 1
    22 158 96 165
85  1130 DATA 58 201 250 144 30
    173 119 158 201 14 162 1 173
    177 158 108
77  1140 DATA 177 158 32 30 171
    76 3 153 162 1 173 175 158 1
    08 175 158 32
6D  1150 DATA 30 171 96 238 116
    158 162 1 173 117 158 141 8
    3 189 117 158
92  1160 DATA 141 9 3 96 173 186
    153 208 21 173 167 153 201
    160 208 14 162
E4  1170 DATA 1 173 193 158 108
    193 158 32 30 171 169 0 56 1
    69 255 56 173
9E  1180 DATA 121 158 197 57 208
    18 173 120 158 197 58 208 3
    108 117 159
4B  1190 DATA 173 118 158 56 233
    1 141 118 158 169 176 20 173 12
    9 158 56 233
7C  1200 DATA 1 141 1 9 158 173
    4 32 149 153 32 48 152 32 14
    7 153 96 5 162
BC  1210 DATA 0 189 121 158 32 1
    65 153 232 138 208 246 165 5
    9 141 121 158
71  1220 DATA 165 58 141 122 158
    32 196 152 108 117 158 162
    4 189 121 158
40  1230 DATA 157 142 158 202 20
    8 247 173 121 158 141 142 15
    8 96 162 4 189
F7  1240 DATA 147 158 157 121 15
    8 202 208 247 173 142 158 14
    1 121 158 96
71  1250 DATA 141 0 160 238 160
    153 208 3 238 167 173 96 162
    0 189 0 0 157
AA  1260 DATA 0 224 189 0 1 157
    0 225 189 0 2 157 0 226 189
    0 3 157 0 227
71  1270 DATA 189 0 4 157 0 228
    189 0 5 157 0 229 189 0 6 15
    7 0 230 189 0
FD  1280 DATA 7 157 0 231 232 20
    8 235 96 162 0 189 0 216 157
    0 232 189 0
20  1290 DATA 217 157 0 233 189
    0 218 157 0 234 189 0 219 15
    7 0 235 232 208
69  1300 DATA 229 96 173 32 208
    141 0 236 173 33 208 141 1 2
    36 173 134 2
0A  1310 DATA 141 2 236 173 21 2
    08 141 3 236 173 17 208 141
    4 236 173 22
AA  1320 DATA 208 141 5 236 173
    24 208 141 6 236 169 254 141
    32 208 169 240
2F  1330 DATA 141 33 208 169 14
    141 134 2 169 0 141 21 208 1
    69 27 141 17
E3  1340 DATA 208 169 200 141 22
    208 169 21 141 24 208 96 32
    243 157 32 212
9F  1350 DATA 154 32 228 155 32
    32 158 32 247 155 173 189 15
    3 174 157 153
00  1360 DATA 58 233 5 141 0 158
    173 1 208 142 1 158 32 243
    157 32 228 155
37  1370 DATA 32 32 158 32 3 156
    32 12 188 32 15 156 162 1 1
    73 60 159 189
D6  1380 DATA 60 159 170 32 212
    187 169 0 141 0 158 169 100
    141 1 158 173
9A  1390 DATA 0 158 153 56 237 0 1
    58 141 45 159 173 167 153 2
    7 1 156 141 44
0B  1400 DATA 159 169 0 141 43 1
    59 32 32 158 32 247 155 32 1
    2 188 162 1 173
37  1410 DATA 118 158 188 118 15
    9 162 0 32 7 187 32 170 177
    141 54 158 140
E1  1420 DATA 53 159 96 162 4 18
    9 121 158 157 4b 159 20. 208
    247 173 121
E1  1430 DATA 158 141 46 159 96
    162 0 189 32 159 0 4 157 0 F
    157 0 0 232
A9  1440 DATA 208 244 169 32 16
    7 255 6 202 208 250 96 169 0
    141 196 158
8B  1450 DATA 169 9 141 197 158
    96 24 174 196 158 172 197 15
    8 32 240 255
A7  1460 DATA 96 162 8 189 34 15
    9 202 189 34 159 142 195 158
    32 30 171 c30
FB  1470 DATA 196 158 32 138 15
    174 195 158 202 208 231 169
    23 141 196 158
```

```
6F  1480 DATA 32 10 155 162 1 17
    3 168 155 169 128 155 32 30
    171 230 196 158
26  1490 DATA 32 10 155 162 1 17
    3 110 159 168 110 159 32 30
    171 169 4 141
47  1500 DATA 196 158 32 10 155
    169 194 32 210 255 169 17 14
    1 197 158 32
9S  1510 DATA 10 155 169 194 32
    210 255 169 30 141 197 158 3
    2 10 155 169
69  1522 DATA 194 32 210 255 169
    8 141 197 158 238 196 158 1
    73 196 158 201
D7  1530 DATA 23 248 6 32 10 155
    76 92 155 169 4 141 196 158
    169 9 141 197
BE  1540 DATA 158 32 10 155 96 1
    69 10 141 197 158 32 10 155
    96 173 121 158
BC  1550 DATA 141 45 159 173 122
    159 141 44 159 169 0 141 43
    159 32 32 158
02  1560 DATA 32 247 155 32 221
    189 32 139 168 32 33 171 96
    169 10 141 197
53  1570 DATA 158 32 10 155 96 1
    73 40 159 141 43 159 173 49
    159 141 44 159
28  1580 DATA 173 50 159 141 45
    159 96 173 123 158 141 43 15
    9 173 124 158
03  1590 DATA 141 44 159 173 125
    158 141 45 159 96 162 1 173
    140 158 141
F3  1600 DATA 140 158 32 162 187
    96 162 1 173 140 158 108 14
    0 158 32 80 184
EB  1610 DATA 96 162 1 173 51 15
    9 168 51 159 162 0 32 7 187
    96 169 9 141
3E  1620 DATA 197 158 238 196 15
    8 173 196 158 201 23 176 4 3
    0 10 155 96 169
31  1630 DATA 0 32 32 208 255 240 2
    51 201 136 248 45 201 135 24
    0 7 201 133 240
FA  1640 DATA 50 78 46 158 173 0
    156 56 233 195 176 3 206 1
    158 141 0 158
CE  1650 DATA 173 1 158 201 169
    176 10 169 0 141 0 158 169 1
    60 141 1 158
F9  1660 DATA 32 243 157 32 230
    154 32 255 154 32 10 155 32
    21 155 96 238
84  1670 DATA 112 159 96 173 1 1
    58 205 167 153 144 10 206 9
    173 0 158 205
18  1680 DATA 158 153 176 1 96 3
    2 158 155 32 167 155 32 240
    155 169 32 32
A5  1690 DATA 210 255 169 40 32
    210 255 32 29 156 169 194 32
    210 255 169
39  1700 DATA 7 169 45 32 210 25
    5 202 208 246 169 194 32 210
    255 162 12 189
E1  1710 DATA 45 32 210 255 202
    208 248 238 196 158 32 10 15
    5 173 196 158
67  1720 DATA 201 23 144 12 32 2
    30 154 32 255 154 32 10 155
    32 21 155 173
67  1730 DATA 53 159 141 121,158
    173 54 159 141 122 158 32 1
    59 159 32 167
8C  1740 DATA 155 32 208 155 162
    1 173 68 158 186 68 159 32
    162 187 32 221
79  1750 DATA 189 32 135 168 32
    33 171 169 0 32 228 255 240
    251 201 133 240
EA  1760 DATA 41 201 135 240 33
    201 136 240 3 76 4 157 169 0
    141 0 158 169
18  1770 DATA 158 141 1 158 32 2
    30 154 32 255 154 32 10 155
    32 21 155 32
23  1780 DATA 181 158 96 32 70 1
    56 96 169 255 141 112 159 96
    173 112 159
2B  1790 DATA 96 169 182 141 128
    158 169 0 141 125 159 169 0
    141 126 159
37  1800 DATA 141 0 158 169 168
    141 167 153 141 1 158 169 0
    141 112 159 96
80  1810 DATA 120 173 1 0 41 253
    141 1 0 96 173 1 0 0 2 141
    1 0 88 96 173
8E  1820 DATA 0 236 141 24 208 1
    73 5 23 141 22 208 173 4 23
    5 141 17 208
F7  1830 DATA 173 3 236 141 21 2
    08 173 2 236 141 134 2 173 1
    236 141 33 208
4C  1840 DATA 173 0 236 141 32 2
    08 96 162 0 189 0 232 157 0
    216 189 0 233
A1  1850 DATA 157 0 217 189 0 23
    4 157 0 218 169 0 235 157 0
    219 232 208 72
82  1860 DATA 96 162 0 189 0 224
    157 0 3 189 0 226 157 0 2 1
    89 0 227 157
6D  1870 DATA 0 3 169 0 228 157
    0 4 189 0 229 157 0 5 169 0
    230 157 0 6 189
76  1880 DATA 0 231 157 0 7 232
    208 211 96 32 228 255 208 25
    1 96 173 1 0
ED  1890 DATA 41 254 141 1 0 162
    0 189 5 159 0 158 157 121 1
    58 232 136 208
87  1900 DATA 246 173 0 158 24 1
    05 5 141 0 158 144 3 238 1 1
    58 173 1 0 9
01  1910 DATA 1 141 1 0 96 173 4
    3 159 141 131 158 173 44 159
    141 132 158
28  1920 DATA 173 45 159 141 133
    158 169 0 141 134 158 169 1
    32 141 139 158
F6  1930 DATA 32 84 158 14 131 1
    58 178 22 206 130 158 14 132
    0 158 144 3 238
5F  1940 DATA 131 158 14 133 158
    144 235 238 132 158 24 144
    229 78 131 158
12  1950 DATA 96 24 173 131 158
    105 132 158 208 12 176 10 10
    9 133 158 208
79  1960 DATA 5 176 3 238 133 15
    8 96 0 117 158 51 153 0 0 0
    0 0 0 169 182
F1  1970 DATA 5 0 0 0 0 0 0 134 11
    2 0 0 0 138 158 0-0 0 0 0 84
    82 65 67 67
65  1980 DATA 32 83 84 65 82 84
    69 68 0 84 32 65 67 69 32 83
    84 79 82 80
F6  1990 DATA 69 68 0 147 158 16
    1 158 78 79 32 84 82 65 67 6
    9 32 66 65 84
E4  2000 DATA 65 0 179 138 0 0 0
    176 195 195,195 195 195 195
    195 179 195
36  2010 DATA 195 195 195 195 19
    5,195 195 195 195 195 195 17
    4 0 194 32 76
4E  2020 DATA 73 78 69 32 32 194
    32 69 76 65,80 83 69,69 32
    32 32 32 194
F0  2030 DATA 0 194 32 32 76 78
    32 32 32 194 32 84 73 77 69
    32 40 83 69 67
49  2040 DATA 41 32 194 0 171 19
    5 195 195 195 195 195 195 21
    9 195 195 195
1E  2050 DATA 195 195 195 195 19
    5 155 195 195 195 179 0 0 11
    158 244 158
A8  2060 DATA 221 158 198 158 0
    0 0 0 0-0 0 0 135 158 0 0 0
    0 0 0 55 159
95  2070 DATA 19 173 195 195 195
    195 195 195 195 145 177 195 195
    195 195 195
9C  2080 DATA 195 195 195 195 19
    5 195 195 169 0 32 78 40 61
    69 78 68 32 78
21  2090 DATA 53 61 65 80,32 78
    55 61 68 73 67 78 0 83 159 8
    0 159 0 131 32
32  2100 DATA 0 0 0 113 159 0 0
    117 65 0 1 247 245 138 138 2
    55 255 138 138
D7  2110 DATA 255 255 138 138 25
    1 255 138 138 255 255 138 13
    8 255 255 138
13  2120 DATA 138 255 255 138 13
    8,255 255 138 138 255 255 0
    0 117 117 0 0
90  2130 DATA 117 117 0 0 117 11
    7 0 0 117 117 0 0 117 117 0
    0 117 117 0 0
03  2140 DATA 117 117 0 0 117 11
    7 138 138 255 255 138 138 25
    5 255 138 138
29  2150 DATA 255 255 138 138 25
    5 255 138 138 255 139 202 13
    8 255 254 138
09  2160 DATA 138 255 255 138 13
    8 255 255 0 0 117 117 0 0 11
    7 117 0 0 117
80  2170 DATA 117 0 138 117 117
    0 0 117 117 0 0 247 117 0 0
    117 117 0 3 245
66  2180 DATA 247
```

PROGRAM PANAL64 LDR

```
58  10 LDB=CHR$(34)+ C64PANAL +C
    HR$(34)+  1
72  20 PRINT |CLR DOWN3|LOAD  LD
    $  |DOWN$ LEFT16|RUN|HOME|
46  30 FOR1=631TO635 POKEI 13 WE
    XT
62  40 POKE198 5
AA  50 POKE45152 0
31  60 POKE641 0:POKE642 192 POK
    E43 1 POKE44 192
6C  70 POKE643 255 POKE644 207:P
    OKE55 255 POKE56 207 NEW
```

PROGRAM PANAL64

```
70  10 GOSUB10000 GOSUB9000 T1=T
    1 GOTO30
87  20 PC=PC+1 PB=PEEK(PC) RETUR
    N
53  30 LA=PEEK(PC)+PEEK(PC+1)*25
    6
14  40 IFLA=0THENPC=PC+2 T2=TI G
    OTO188#
88  50 PC=PC+4 NL=NL+1:PB=PEEK(P
    C)
08  55 LN=PEEK(PC 2)+PEEK(PC-1)*
    256 PRINT |HOME| ;LN
7F  57 IFPB=0THENPC=PC+1 GOTO30
55  70 IFPB=34GOTO150
30  90 IFPB<128GOTO200
F7  100 PB=PBAND127 TK(PB)=TK(PB
    )+1 NT=NT+1
F0  110 IFPB=3GOTO300
7B  115 IFPB=15GOTO350
3E  120 GOSUB20 GOTO60
98  130
C8  150 GOSUB20 IFPB=34GOTO200
82  160 IFPB=0GOTO60
91  170 GOTO150
2F  200 IFPB>64ANDPB<91THENGOSUB
    400 GOTO60
88  210 GOSUB20 GOTO60
E8  220
F6  300 GOSUB20 IFPB=0GOTO60
3E  310 IFPB=58THENGOSUB20 GOTO6
    0
FB  320 GOTO300
71  330
C4  350 GOSUB20 IFPB=0GOTO60
56  360 GOTO350
```

```
93  400 (<0 VR$=   VR$-CHR$(PB)
7B  410 GOSUB20
3B  420 IFPB>64ANDPB<91THENVR$=V
    R$+CHR$(PB) GOTO410
23  425 IFPB>47ANDPB<58THENVR$=V
    R$+CHR$(PB) GOTO410
85  430 IFPB=26ORPB=37THENVR$=VR
    $+CHR$(PB) COSUB20
C9  440 IFVN$(X)=   THENVN$(X)=VR
    $ VA(X)=VA[X]+1 NV=NV+1 RETU
    RN
67  450 IFVN$(X)=VRSTHENVA(X)=VA
    [X]+1 RETURN
4B  460 X=X+1 IFX<50GOTO440
5B  470 RETURN
00  1000 PRINT (CLR]   PROGRAM
    STATISTICS --
0A  1005 PRINT (DOWN] PROGRAM NA
    ME[5PC4]=   NM$
C3  1010 PRINT [DOWN] PROGRAM SI
    ZE[5PC4]=  PC -2049
8B  1020 PRINT [DOWN] NO OF LINE
    S[5PC5]=  NL
92  1030 PRINT [DOWN] NO OF COMM
    ANDS  =  NT
58  1035 PRINT (DOWN] NO OF VARI
    ABLES =  NV
00  1040 GOSUB1150
74  1060 X=0 PRINT [CLR]  COMMAN
    DS -
5E  1070 FOR1=0TO127 IFIK(1)=0AN
    D1>74THENNEXT GOTO1120
6D  1075 IFTK(I)=0THENGOSUB3000
    NEXT GOTO1120
3E  1080 X=X+1 IFX>23GOTO1110
4B  1100 GOSUB1150 X=0 PRINT (CL
    R]
55  1110 GOSUE3000 GOSUB3100 NEA
    T
0=  1120 GOSUB1150 GOTO1200
42  1140
2C  1150 IFPA-1THENPETURN
DB  1160 PRINT [DOWN]  USE ANY K
    EY TO CONTINUE
02  1170 GETR$ IFR$=  GOTO1170
2E  1180 RETURN
0E  1200
97  1210 PRINT [CLR]- VARIABLES
        X=0 J=0
F4  1220 IFX>49GOTO1300
1E  1225 IFVN$(X)=  GOTO1300
3C  1230 PB=LEN(VN$(X)) IFPB>3TH
    ENPB=3
F3  1240 ONPBGOTO1250 1260 1270
9B  1250 PRINTVN$(X)    =   GOTO
    1280
09  1260 PRINTVN$(X)   =   GOTO1
    280
59  1270 PRINTVN$(X)  =
AL  1280 PRINTVA(X)
1B  1290 X=X+1 J=J+1 IFJ>22GOTO1
    220
70  1294 J=0  COSUB1100
B2  1295 PRINT [CLR]   GOTO1220
25  1300 PRINT [DOWN] R=RE-DISPL
    AY  X=END  P=PRINTER  CLOSE
    4 PA=4
47  1310 GETK$ IFR$=  GOTO1310
EB  1320 IFR$= R GOTO1510
FF  1330 IFR$= X GOTO2000
5E  1340 IFR$= P THENCLOSE4 GOTO
    1500
C1  1350 GOTO1310
7F  1500 OPEN4 4 CMD4 PA=1
F4  1510 X=0 TN=41116 GOTO1000
F7  1590
50  2000 PRINT [CLR DOWN]TIME TA
    KEN=  (T2-T1)/60 END
B3  2400
5E  3000 TN$=   PB=PEEK(TN)
9C  3010 IFPB>127THENPB=PBAND127
    TN$=TN$+CHR$(PB) TN=TN+1 RE
    TURN
40  3020 TN$=TN$+CHR$(PB) TN=TN+
    1 PB=PEEK(TN) GOTO3010
DE  3030
CD  3100 J=LEN(TN$) J-7-J PRINTT
    N$[PC(J) =  TK(1) RETURN
71  9000
```

```
C5  9020 REM  LOAD BASIC PROGRAM
     AT 2049
F7  9130
F9  9140 INPUT LOAD FROM DISK (Y
    /N)  R$
41  9150 IFR$= N THENDE-1 GOTO92
    00
E5  9160 IFR$= Y THENDE-8  GOTO92
    00
85  9170 GOTO9140
C5  9180
33  9200 INPUT PROGRAM TO BE LOA
    DED=>  NM$
BE  9210 FL=LEN(NM$)
44  9220 FORJ=1TOFL POKE511+J AS
    C(MID$(NM$ J 1)) NEXT
4B  9230
31  9300 POKE780 192 SYS65424
B3  9310 POKE780 1 POKE781 DE PO
    KE782 8
BD  9340 SYS65496
AB  9350 POKE780 FL POKE781 0 PO
    KE782 2
7C  9360 SYS65493
6B  9370 POKE780 0 SYS65424
CA  9420
74  9430 RETURN
3E  9440
9B  10000 PB=0 PC=2049 NB=0 NL=0
     LA=0 DIMTK(127) NT=0 NV=0 X
    =0 J=0 TN=41110 PA=0
9E  10015 DIMVA(49) DIMVN$(49) V
    R$=   TN$=   A$=   NM$=
41  10020 PRINT [CLR]   RETURN
```

PROGRAM SWITCH64

```
D1  1000
E3  1010 REM THIS PGM PERFORMS 2
     FUNCTIONS
90  1020 REM (1) IT IS THE BASIC
     LOADER FOR
B3  1030 REM      THE SCREEN ENIT
    CH ML PGM &
D4  1040 REM (2) IT INITIALISES
    $D8-727
03  1050 REM      WITH VALUES TO
     BE USED IN
0F  1055 REM      ZERO PAGE LOCAT
    IONS 43 6E
32  1060 REM      FOR THE SCREEN
    SWITCH ML
42  1065 REM      PGM
15  1067 ;
6D  1070 POKE51 255 POKE52 159 P
    OKE53 255 POKE54 156 POKE55
    255 POKE56 155
B8  1075 GOSUB10000          REM
    LOAD ML PGM
A5  1080 SA=PEEK(43)+PEEK(44)*25
    6
DC  1090 EA=PEEK(55)+PEEK(56)*25
    6
44  1100 INPUT ENTER REGION 0 EM
    DING ADDR --->  R0
E6  1110 IFR0<SAGOTO2050
04  1120 IFR0>EAORR0=EAGOTO2100
5F  1130 AD=R0 GOSUB9000
D7  1140 POKE51 LB POKE52 HB  RE
    M SETUP R0
A1  1150 POKE53 LB POKE54 HB  RE
    M MEMORY
A0  1160 POKE55 LB POKE56 HB  RE
    M LIMITS
22  1170 FOR1=0TO23 POKE$D8+I PE
    EK(43+I) NEXT
9A  1180
B9  1190 REM SET REGION 1 POINTE
    RS IN 784 727
5E  1200
04  1210 POKE$E4+1 8          REM F
    OR BASIC
A7  1220 R1=R0+2          REM R
    GN 1 ADDR
```

```
AE  1230 AD=R1 GOSUB9000          R
    EM START OF
76  1240 POKE784 LB POKE785 HB R
    EM BASIC
DE  1250 AD=R1+2 GOSUB9000        R
    EM START OF
F2  1260 POKE786 LB POKE787 HB R
    EM VARIABLS
9F  1270 AD=R1+9 GOSUB9000
7B  1280 POKE788 LB POKE789 HB R
    EM ARRAYS
36  1290 POKE710 LB POKE711,HB R
    EM START END
6A  1300 AD=EA GOSUB9000
51  1310 POKE712 LB POKE713 HB R
    EM STRINGS
F3  1320 POKE714 LB POKE715 HB R
    EM UTILITY
FD  1330 POKE716 LB POKE717 HB R
    EM MEM LIMIT
2E  1340 FOR1=718TO725 POKE1 0 N
    EXT
61  1350 AD=R1-1 GOSUB9000
FF  1360 POKE726 LB POKE727 HB R
    EM DATA STM
65  1370
FA  1380 PRINT REGION 0 &[55PC]1
     INITIALISED
6C  1390 PRINT REGION ACTIVATED
    - 0
18  1400 SYS40704 END
ED  2000
DA  2010 REM  ERROR MESSAGES
01  2020
65  2030 PRINT REGION 0 ENDING A
    DDR  ;R0  <[5SPC]REGION 0 ST
    ARTING ADDR   SA
29  2040 PRINT PLEASE REENTER RE
    GION 0 STARTING ADDR
18  2070 GOTO1180
1D  2080
90  2100 PRINT REGION 0 ENDING A
    DDR  R0  > MEMORY LIMIT   E
    A
57  2110 GOTO2080
8A  2120
72  9000 NB=INT(AD/256) LB=AD (H
    8*256) RETURN
A0  10000
5E  10010 REM  DATA STATEMENTS F
    OR ML PGM
71  10020
9E  10170 DATA 120 173 20 3 141
    171 159 173 21 3 141 172 159
     169 39 141 20 3 169
B0  10110 DATA 159 141 21 3 162
    0 160 48 169 168 2 157 173 1
    59 232 136 200
F8  10120 DATA 246 96 96 165 197
     201 64 240 122 201 3 240 7
    201 4 240 3 76
C3  10130 DATA 157 159 174 170 1
    59 240 2 162 24 169 0 141 22
    3 159 185 43 8
6E  10140 DATA 157 173 159 232 2
    00 192 24 144 244 173 223 15
    9 201 3 240 5
F8  10150 DATA 162 0 142 170 159
     76 182 159 162 1 142 170 15
    9 162 24 160 0
A9  10160 DATA 169 173 159 153 4
    3 0 232 200 192 24 144 244 1
    65 43 141 128
C8  10170 DATA 2 165 44 141 130
    2 165 55 141 131 2 165 56 14
    1 132 2 173 170
FC  10180 DATA 159 9 176 141 225
     159 172 134 2 162 0 189 224
     159 240 13 41
3D  10190 DATA 191 157 35 4 152
    157 35 216 232 76 140 159 10
    8 171 159 8 40
EF  10200 DATA 234 1 8 146 49 17
    4 45 79 68 253 78 253 79 255
     79 126 4 2 0
D5  10210 DATA 55 33 4 0 0 0 0 1 0
    0 50 85 50 85 50 84 255 159
    255 159 0 160
95  10220 DATA 249 159 0 0 144 0
```

```
    0 0 0 86 51 0 4 210 199 208
    169 176 0 117
25  10230 DATA 117 0 0 117 117 0
    0 117 117 0 0 147 147 128 0
    117 117 0 0 117
74  10240 DATA 117 0 0 255 255
20  10250 FOR I= 49704TO 49958
25  10260 READ J X=X+J POKE I J NE
    XT
8F  10270 IFX= 29726THENRETURN
D6  10280 PRINT DATA STATEMENTS
    INVALID  END
```

Returner

```
PROGRAM  RETURNER CHE
```

```
0F   0 REM
14   1 REM [illegible] REMEMBER I  S
     A1SE Ex
AL   2 REM E  THE FILL  IC POKES
      BEFORE
04   3 REM TH  D  IN AND RUNNING
     THIS PRG
F0   4 REM IN DIRECT MODE TYPE  F
     OKE44 1a
AE   5 REM POKE4095 0:NEW
B9   6 REM
FC   10 I=2044
2D   20 READ A IF A=256 THEN 3000
57   30 POKE  A I=I+1 GOTO 20
07   2044 DATA 58 0 10 0 138 58 4
     9 49
0E   2057 DATA 48 58 143 34 20 20
     28 28
7E   2065 DATA 28 28 28 28 28 28
     28 28
6C   2073 DATA 147 28 48 67 41 49
     57 58
F6   2081 DATA 57 32 88 69 84 89
     82 34
4D   2089 DATA 87 69 76 71 72 73
     74 75
4E   2097 DATA 0 0 0 0 0 0 0 0
EF   2105 DATA 0 0 0 0 0 169 7 14
     1
99   2113 DATA 174 . 162 0 189 25
     6 32
B0   2121 DATA 210 255 232 224 44
     208 245 16
3C   2129 DATA 0 169 0 162 32 200
     141 33
88   2137 DATA 208 134 2 232 208
     252 200 208
39   2145 DATA 250 238 2 165 2 20
     1 4 208
85   2153 DATA 242 162 0 189 128
     5 157 0
78   2161 DATA 207 232 224 129 20
     8 245 76 0
C3   2169 DATA 207 234 234 234 23
     4 234 234 169
EB   2177 DATA 55 133 1 32 21 253
     32 24
F7   2185 DATA 229 169 0 141 24 3
     169 207
49   2193 DATA 141 25 3 169 0 141
     32 208
50   2201 DATA 141 33 208 169 128
     141 145 2
05   2209 DATA 169 13 32 210 255
     32 65 165
64   2217 DATA 32 183 253 32 122
     166 169 0
01   2225 DATA 168 1 162 0 32 186
     255 169
A8   2233 DATA 4 162 112 160 207
     32 189 255
```

```
C5   2241 DATA 169 . 141 1
     13 255 32
7    2249 DATA 169 .  .  .  .  160
     169 6 140
B4   2257 DATA  .  .  .  .  .  1
     174 198
43   2265 DATA 45 1 .  .  .  19 1
     65 175 198
3B   2273 DATA 48 198 48 198 58 3
     2 69 16h
FF   2281 DATA 76 1 .  .  .  234 234
     234 234 .
74   2289 DATA 169 73 65 100 168 1
     68 168 169
2E   2297 DATA 168 168 168 168 16
     8 168 168 .
C8   3000 POKE49 1 F KE44 0 POKE4
     5 255 POKE46 .
DE   3010 SAVE RET  RNER $CF00  8
     1
```

```
PROGRAM RETURNER-CHECKER
```

```
E5   10 POKE53280 2 POKE53281 0
AC   20 PRINT {CLR 11}CHECKER PRO
     GRAM
7D   30 PRINT {YELLOW DOWN2}F1=SI
     TYPE N & RETURN
4A   40 PRINT {DOWN}THEN LOAD MEN
     U  LOAD A FILE[SPC 16 RESET
8A   50 PRINT {DOWN}LOAD MENU  LO
     AD ANOTHER FILE  RESET
3B   60 PRINT {DOWN}REPEAT UNTIL
     ALL FILES LOADED
C1   70 PRINT {DOWN}LOAD CHECKER
     AND TYPE Y
A7   80 INPUT {DOWN C1}HAVE YOU W
     IPED MEMORY  BEFORE  A$
33   90 IFA$= N THEN370
B9   100 POKE53280 0
5A   101 INPUT TO PRINTER  F$
6B   102 IFF$= Y THENP=1 OPEN1 4
F4   110 POKE58334 PEEK(56334)AND
     254
3A   120 J=129 Z=0 F=0
91   130 PRINT {CLR}POSITIONS FRE
     E{YELLOW DOWN}
07   140 FOR1=820TO1023 J=J-1 IFP
     EEK(I)<>252THENJ=129 I=I+120
     GOTO170
15   150 IFJ.0THEN170
ED   160 F=1 PRINTI 128  Z=Z+1 IF
     Z=84THENGOSUB310
32   165 IFF=1THENGOSUB500
2B   170 NEXT
6A   180 J=129
76   190 FORI=5000TO32768 J=J-1 I
     FPEEK(I)<>252THENJ=129 I=I+1
     28 GOTO210
FF   200 IFJ.0THEN220
55   210 F=1 PRINTI=128  J=8 I=I+
     99 Z=Z+1:IFZ=84THENGOSUB310
40   215 IFF=1THENGOSUB500
5E   220 NEXT
0E   230 J=129
EE   240 FORI=49152TO53247 J=J-1
     IFPEEK(I)<>252THENJ=129 I=I+
     120 GOTO270
28   250 IFJ.0THEN270
3C   260 F=1 PRINTI=128  J=8:I=I+
     99 Z=Z+1 IFZ=84THENGOSUB310
15   265 IFF=1THENGOSUB500
0D   270 NEXT
BB   275 IFF=0THENPRINT {DOWN2}NO
     SPACE FREE IN MEMORY
7E   290 POKE56334 PEEK(56334)OR1
04   300 CLOSE1 END
9E   310 Z=0 PRINT PRINT PRESS AN
     Y KEY TO CONTINUE OR E TO EN
     D[HOME]  F=1
0B   320 POKE56334 PEEK(56334)OR1

8E   330 GETA$ IFA$=  THEN330
14   340 IFA$= E THENCLOSE1 END
25   350 POKE56334 PEEK(56334)AND
     254
1D   360 PRINT {CLR C1}POSITIONS
     FREE[DOWN YELLOW]  RETURN
```

```
E5   370 PRINT {CLR DOWN2 YELLOW}
     WIPING  POKE56334 PEEK(56334
     )AND254
3C   380 POKE53265 PEEK(53265)ANT
     239
8B   390 FORI=820TO1023 POKEI 252
     NEXT
A7   400 FORI=5000TO32768 POKEI 2
     52 NEXT
5C   410 FORI=49152TO53247 POKEI
     252 NEXT
FE   420 POKE53265 PEEK(53265)OR1
     6
9A   430 POKE56334 PEEK(56334)OR1

89   440 PRINT {CLR DOWN2}LOAD CH
     A$(34) MENU CHR$(34)  8{HOME
     1 }
43   450 END
A1   500 IFJ>0THEN520
D6   510 PRINT#1 I-128
84   520 RETURN
```

```
PROGRAM RETURNER-EDIT
```

```
48   10 PRINT {CLR}F{SO}44 10 P{S
     O}256 0 NEW
4B   20 PRINT {DOWN2}LOAD CHR$(34
     1 EDIT R CHR$(34)  0
1C   30 POKE198 1 POKE631 19 POKE
     632 13 POKE633 13 POKE634 82
     POKE635 213 POKE636 13
```

```
PROGRAM RETURNER EDIT R
```

```
94   10 X=X+1 IFX=1THENLOAD RETUR
     NER $CF00  $ 1
C5   20 POKE53280 0 POKE53281 0
70   30 PRINT {CLR C1}  RETURNER
     POSITIONER
4F   40 PRINT  {DOWN LEFT WHITE}(
     C)1989 PETER WEIGHILL[DOWN3]

1C   50 INPUT {YELLOW}START ADDRE
     SS[SPC3]$334{LEFT*3}  SA$
12   53 IFLEFT$(SA$ 1)= $ THENGOS
     UB2110 SA=NU GOTO60
AA   56 SA=VAL(SA$)
55   58 IFSA(820ORSA>53150THEN56
F3   70 INPUT {DOWN YELLOW}FILENA
     ME TO LOAD[SPC3]MENU[LEFT5]
      FI$
EA   80 SH=INT(SA/256) SL=SA-(SH*
     256)
33   90 INPUT {DOWN YELLOW}FILENA
     ME OF SAVED PROG[SPC3]-[LEFT
     3]  SF$
29   100 S$=
FA   110 INPUT {DOWN YELLOW}ARE Y
     OU SURE  S$
AF   120 IFS$= N THEN20
E5   130 LF=LEN(FI$) FI$=LEFT$(FI
     $+ {8SPC17}  18)
CE   140 S1=SH:S2=SL+112 IFN>255
     THENS2=S2-256 S1=S1+1
4F   150 POKE2161 SH POKE2169 SH
     POKE2192 SH POKE2237 S1
7C   160 POKE2160 SL POKE2168 SL
     POKE2187 SL POKE2235 S2
C9   170 FOKE2283 LF
73   180 FORI=2288TO2288+15 POKEI
     ASC(MID$(FI$ 1-2287 1)) NEX
     I
F4   190 PRINT {CLR}F{SO}44 0 P{S
     O}43 1 P{SO}46 9,P{SO}45 0 S
     [SA] CHR$(34)SF$CHR$(34)  0
     1
F4   200 POKE198 2 POKE631 19 POK
     E632 13 END
44   2110 NU=0 NU$=RIGHT$(SA$ LE
     N(SA$)-1)
82   21110 IFLEN(NU$)>4THENNU=-1
     GOTO21110
71   21120 IFLEN(NU$)<4THENNU$= 0
     +NU$ GOTO21120
A8   21130 FORI=1TO4 As=MID$(NU$
     1 1) A=VAL(As)
```

```
E4  21140 IFA$<"A" AS  64THEN
    A$(I,55
B8  21150 IF(A$<"0 AND I>0)OR(A
    $GOTO21190
81  21160 N=A*15*(A-1 )U-N
86  21170 NEXT
B0  21180 RETURN
A6  21190 NU=-1 I=4 GOTO 111
```

Flow of Ideas

```
PROGRAM  DIRECTOR

BE  100 POKE53280,0 POKE53281,0
    GOTO440
39  110 GET#8,A$:IFA$=""THENA$=C
    HR$(0)
F6  120 RETURN
95  130 INPUT#15,E,E$,T,S
63  140 IFE>0THENPRINT"[C3] E,E$
    ,T,S:END
18  150 RETURN
9F  160 GOSUB110
07  170 DN$=CHR$(145
3A  180 RETURN
78  190 GET#8,A$:IFA$=""THEN190
AD  200 IFSTTHEN430
AB  210 IFASC(A$)<128THENF$=F$+
    "[SHIFT-*]":GOTO250
20  220 IFASC(A$)AND65THEN230
BD  230 F$=F$+" ":F=(ASC(A$)AND63)
    F=F+128*(E-1):IFASC(A$)AND64TH
    EN[F$="[RUSON]"+CHR$(RUSOFF)
E9  240 F$=MID$(SEQPRGUSERREL,F
    ,3)
C9  250 GOSUB110
DA  260 I$=RIGHT$("  "+STR$(LEN(A
    $)),2)
B2  270 GOSUB110
95  280 S$=RIGHT$("  "+STR$(ASC(A
    $),2)
67  290 A$=""
53  300 FORA=1TO16
28  310 GET#8,A$:NS=NS+A$
C3  320 NEXT
BA  330 FORA=1TO3:GET#8,A$:NEXT
68  340 GOSUB110
17  350 BL=ASC(A$)
54  360 GOSUB110
9F  370 BL=BL+ASC(A$)*256:IFF$<>
    "DEL"THENRT=RT+BL
D5  380 B$=RIGHT$("  "+STR$(BL),
    3)
4C  390 PRINT"[WHITE]   "IFF$="DE
    L"THENPRINT"[2]"
22  400 POKE212,128
53  410 PRINT#15," POKE212,0
A5  420 PRINT"[C8] "B$"  "NS"  "F$
    "[C3]"RT"[SPC3 C7] "S$"[SPC4]
    "S$
21  430 RETURN
F1  440 PRINT"[CLR YELLOW REV] N
    SLOADING HEADER BLOCK"
0A  450 OPEN15,8,15,"I":PRINT#15,"  IO
    ":GOSUB130
CD  460 RT=0:DIM#$(35)
75  470 OPEN8,8,1,"#":S=0:GOSUB1
    30
E2  480 FORA=1TO2:GET#8,A$:NEXT
    A=0
14  490 FORA=1TO35
C0  500 GOSUB110
22  510 A=A+ASC(A$):#$(A)=RIGHT$(
    "  "+STR$(ASC(A$)),3)
15  520 GET#8,A$:GET#8,A$:GET#8,
    A$
```

```
    530 [illegible]
    540 [illegible]
    550 [illegible]
    560 [illegible]
    570 [illegible]
    580 [illegible]
    590 [illegible]
    600 [illegible]
    610 [illegible]
    620 [illegible]
    630 [illegible]
    640 [illegible]
    650 [illegible]
    660 [illegible]
    670 [illegible]
    680 [illegible]
    690 [illegible]
    700 [illegible]
    710 [illegible]
    720 [illegible]
    730 [illegible]
    740 [illegible]
    750 [illegible]
    760 [illegible]
    770 [illegible]
    780 [illegible]
    790 [illegible]
    800 [illegible]
    810 [illegible]
    820 [illegible]
    830 [illegible]
    840 [illegible]
    850 [illegible]
    860 [illegible]
    870 [illegible]
    880 [illegible]
    890 [illegible]
    900 [illegible]
    910 [illegible]
    920 [illegible]
    930 [illegible]
    940 [illegible]
    950 [illegible]
    960 [illegible]
    970 [illegible]
    980 [illegible]
    990 [illegible]
```

ASM Assembler

```
65  10 IF PEEK(44)<>35 THEN PRINT
    "INSUFFICIENT ROOM  CHANGE
    START OF BAS C  END
AC  15 AD=2049:PRINT"[CLR DOWN]
    LOADING DMA INTO MEMORY
3C  20 FOR LN=100 TO 4370 STEP 1
    0
40  21 PRINT"[HOME]";LN
5D  25 RT=0
A3  30 FOR DS=0 TO 15
2C  35 READ BY:POKE AD+DS,BY
5F  40 RT=RT+BY
A6  45 NEXT
CE  50 READ TT:IF TT<>RT THEN PR
    INT"  ERROR IN LINE";LN:END
8C  55 AD=AD+16
ME  60 NEXT
F1  65 PRINT"[DOWN3]SAVING  DMA
    "
42  75 POKE 43,1:POKE 44,8:POKE
    45,193:POKE 46,34:SAVE"DMA
    ",8
CC  80 CLR
B8  85 PRINT"DONE  NOW RESET S/
    STEM":END
9D  100 DATA 12,8,10,0,158,32,50
    ,48,54,53,0,0,0,78,158,31,7
    ,30
35  110 DATA 75,153,18,0,0,0,0,0
    ,0,0,0,0,0,0,0,247
28  120 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0
F1  130 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0
FF  140 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0
05  150 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0
53  160 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0
59  170 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0
87  180 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0
6D  190 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0
3E  200 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0
41  210 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0
4F  220 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0
95  230 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0
A3  240 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0
A9  250 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0
7E  260 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0
7C  270 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0
BA  280 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0
DD  290 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0
DE  300 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0
```

```
E4  310 DATA 0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0
8Z  320 DATA 0 0 0 0 0 0 0 0 0 0
    0 0 0 0,0,0 0
3E  330 DATA 0 0 0 0 0 0 0 0,0 0 0
    0 0 15 39 232 3  6990
E3  340 DATA 100 0 10 0 36 46 56
    ,48 57 48 48,48 49 48 69 66,
    753
5F  350 DATA 65 44 80 44 87 46 6
    5 83 77 44 48 58 185 65 82 0
    2  1209
87  360 DATA 65 78 84 32 211 75
    85 82,67 69 32 186 69 86 73
    67  1372
0E  370 DATA 65 61 0 0 13 195 85
    82 82 69 78 84 32 186 69 83
    1188
A8  380 DATA 84 73 77 65 84 73 7
    8 78 32 195 65 86 73 67 69 6
    1,  1267
BB  390 DATA 0 0 13 0 13 187 78
    84 69 82 32 186 73 76 69 78
    1062
B2  400 DATA 65 77,88 32 40 46 6
    5 83 77 41 58 0 13 205 73 32
    1183
E9  410 DATA 70 73,76 69 78 65 7
    3 69 32 71 73,86 69 78 69 53,32
    1077
EE  420 DATA 193 69 78,82 84 73
    78 71 13,0 13 138 73 76 69 7
    0,  1245
F1  430 DATA 85 77 69 32 84 73 7
    8 32 78 78 71 53 32 208 7
    6  1156
11  440 DATA 68 65 83 69 32 212
    82 69 32 65,71 65 73 78 13 0
    ,  1056
F8  450 DATA 147 13,195 78 77 77
    78 69 75 82 69 32 54 52 32
    136  1331
F8  460 DATA 85 65 78,32 205 70
    84 69 32 183 83 83 69 77 66
    76  1352
0C  470 DATA 65 82 46,13 210 83
    83 73,69 68 78 84 32 214,65
    92  1341
7B  480 DATA 83 73 75 78 32 48 4
    5 49 13,138 73 83 78 32 214
    69  1244
A8  490 DATA 82 83 73 75 78 32 5
    0 46 50 13 211 156 185 32,67
    46,  1323
5D  500 DATA 56 56 13 13 0 13 13
    183 83 83 68 77,66 76 69 82
    582
13  510 DATA 32 200 65 83 83 32
    0 32 66 69 71,73 78 83 46 13
    1034
1C  520 DATA 0 13 133 83 83 69 7
    7 66 76 69 32,67 78 77 80 78
    1160
BD  530 DATA 69 84 58 46 13 211,
    84 65 82 84 32 65 66 66 82 0
    9,  1181
CB  540 DATA 83 83 32 61 36 0 13
    187 78,88 32 65 68 69 82 69
    1035
A1  550 DATA 53 83 69 83 32 61 3
    6 0 13 211 83 77 66 79 76 32
    1050
41  560 DATA 76 73 83 84 73 7E 7
    1,13 0 211,75 65 82 67 68 32
    ,  1176
AD  570 DATA 188 73,76 69 32 58
    32 0 13,196 73 83 75 32 77 7
    9,  1186
6F  580 DATA 69 68 32 83 69 76 6
    9 67 84 65 66 13 0 13 205 65
    1054
C9  590 DATA 77 79,82 83 32 77 7
    5,66 68 32,83 65 76 83 87 84
    1132
A3  600 DATA 83 68 13 0 13 155 5
    5 84 66 76 32 157 82 82 73 8
    2  1205
03  610 DATA 32 77 78 68 68 32 4
    3 65 76 69 67 84 68 66 13 0
    955
F5  620 DATA 13 206,75 78 70 65
    84 65 76 32 187 82 82 78 82
    32  1382
02  630 DATA 77,73 80 65 32 83 6
    8 75 69 67 84 53 FF 13 0 212
    1135
A1  640 DATA 75,84,65 76 32,157
    82 82 75 82,83 32 73 78 32,7
    0  1226
A7  650 DATA 73,76,68 32,61 0 13
    13 211 212,207 208 32,75 83
    ,85  1440
47  660 DATA 32,40 82 69 83 83 6
    9 64 46 13 133 83 83 69 77 6
    5  1156
A6  670 DATA 76,88 32 65 66 79 8
    2 84 69 68 46 13 0 13 208 78
    ,  1067
22  680 DATA 32 83 78,85 82 67 5
    3 32 67,75 69 66 32 70 73 85
    ,  1078
CD  690 DATA 78 68 32 73 78 32 7
    7,65 77 73 82,46 13 0 208 82
    1137
0F  700 DATA 73 78 84 53 82 32 7
    8 75 84 32 65,67 84 73,66 68
    1135
E0  710 DATA 46 13,0 208 82 73 7
    8,84 69,82 32 73 83 32 85 67
    ,  1087
04  720 DATA 84 73 86 65 46 13 0
    ,14 147 5,195 76 77,77 78 68
    1112
B4  730 DATA 78 82 63,32,54 52 3
    2 138 205 193 32 211 83 83 8
    4 53,  1582
EE  740 DATA 77 32,73 78 83 84 6
    5,76 76 68 68 13 212 83 80 6
    9  1244
E5  750 DATA 32 42 72 65 76 40 3
    2 70 79 82 32 65 32 76 73 83
    ,  535
2C  760 DATA 84,32 78 70 32 67 7
    3 77 77 85 78 68 83 13 0 78
    582
95  770 DATA 69 87 13,196 85 65,
    78 32,205 79 88 68 32 193 83
    83  1435
55  780 DATA 83 77 66 76 68 82 3
    2 40 195 205 193 41 13 210,5
    3,83  1521
34  790 DATA 73 68 83 78 84 32 2
    14 43 46 49 13 196 73,83 75,
    32  1234
0E  800 DATA 214 50 46 50,13 138
    82 73 86 69 82 83 32 214 52
    46  1360
AF  810 DATA 53 13 195 73 77 77,
    85 78 68 32 214 51 46 48 13
    211  1320
E5  820 DATA 65 80,84 53 77 66 6
    8 82 32 48 57,66 66 50 211 4
    6  1161
1B  830 DATA 196 46 32,195,65 82
    82 73 69 13,0,66 82 75 0 87
    1143
3E  840 DATA 78 67 24,87 75 66 2
    16 67 76 73,88 67 76 86 184
    68  1378
E9  850 DATA 58 88 202 66 69 88
    ,136 73 78,88 232 73 78 85 20
    0,78  1710
E3  860 DATA 79 80 234,80 72 65
    72 80 72 80,8,80 76 65 104 8
    0  1387
7F  870 DATA 76 80,40,82 84 73 8
    4 88 84 83 85 83,65 67 56 83
    1202
80  880 DATA 83 65 248 83 80 73
    120 84 65 68 170 84 65 83 16
    8,84  1527
70  890 DATA 83 68 186 84 88 85
    138 84 88 83,154 84 85 65 16
    2 65  1597
83  900 DATA 67 67 144 69 67,83
    170 66 88 81 240,56 77 73 46
    66  1456
1D  910 DATA 78,65,208 66 80 76
    16 65 8F 87 80 66 86 83 112,
    66  1304
C2  920 DATA 68 67 0 65 78 68 11
    66 83 76 22 66 73,84 33 67,
    926
0F  930 DATA 77 80 44 67 80 88 5
    5 67,80 83 68,68 83 67 77 68
    , 1143
70  940 DATA 78 82,80 73 78,67 8
    3,74 77 80 110,74,83 82,101
    76  1343
7D  950 DATA 68 65 132,76 68 88
    143 76 68 88,154 76,83,82 16
    5 75  1512
56  960 DATA 82 85 175 92,78 76
    187 82 78 82 188 83,66 67 20
    8 83  1809
11  970 DATA 84 65 220,83 84 84
    231 83 84 83 242 66 66 84 0,
    87  1873
11  980 DATA 79 82 1,65 81 80 2
    68,81 85 3 76 82 71 4 82  94
    0
5C  990 DATA 85 65 69 5 78 83 84 6
    83 88 77 7,76,78 75,F 62  98
    1
CA  1000 DATA 68 76 3 255 105 10
    1 117 255 103,125 121 87 113
    ,255,255 41  2103
F5  1010 DATA 37 53,255 45 51 57
    32 48 255 10,255 6 32 255 1
    4 30  1437
EF  1020 DATA 255 255 255 255 25
    5,256 36 255 255 44 255 255
    255 255 255 255  3650
5F  1030 DATA 201 137 213 255 20
    5 221 217 153 208 255 255 22
    4 226 255 255 236  3619
42  1040 DATA 255 255 255 255,25
    5 255 192 136,255,255 204,25
    5 255 255 255,255  3807
2A  1050 DATA 255 255 188 214 25
    5 206 222 255 255 255 255 25
    5,73 69 85,255  3382
3C  1060 DATA 77 53 68 55,81 255
    255 255 230 246 255 238 254
    255 255 255  3158
54  1070 DATA 255 255 255 255 25
    5,255 76 255 255,255,255 105
    255 255 255,255,  3754
7E  1080 DATA 255,32 255 255 255
    ,255 255 255 165 185 181 255
    173 165 195 161  3235
FE  1090 DATA 177 255 255,162 10
    5 255 192 174 255 180 255 25
    5 255 255 150 164  3415
4E  1100 DATA 180 255 172 188 25
    5 255 255 255,74 255 70 86 2
    55 78 84 255  2862
50  1110 DATA 255 255 255 255,8 5
    5,21 255 13,28 25,1,17 255 4
    2,255  1947
58  1120 DATA 38 54 255 46 82 25
    5,255 255 255 106 255 102 11
    8,255 110 128  2547
80  1130 DATA 255 255 255 255 255 25
    5,233 225 245,255 237 253 24
    8,225 241 255 255  3852
07  1140 DATA 255 133 142 255 14
    1 157 153 125 145,255,255 25
    5 134 255 150 142  2863
80  1150 DATA 255 255 255,255 25
    5,255 255 132 148 255 140 25
    5 255 255 255 255  3735
50  1160 DATA 255 255 255 65 83
    83 55 205 68 73 83,203 77 83
    ,205 78,  2126
15  1170 DATA 78 78 70 65 84 65
    204 70 65 84 65 204,82,65,70
    65  1447
63  1180 DATA 205 83 88 77 86 79
    78 211 80 82 73 78 84 79,20
    5 80  1648
53  1190 DATA 82 73 78 84,79 70
    196 83 72 79 215 72 68 76 20
    5 82  1620
50  1200 DATA 69 83 69 212 73 78
    70 207,83 69 82,210 68 69 8
    2 210  1734
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EA 1210 DATA 83 78 85 82 67 197
,58,63 83 212 58 67 77 196 8
3 57  1583
53 1220 DATA 77,156 83 67 65,21
2,58 67 85 212 67 76 211 66
69,210  1831
FB 1230 DATA 0 14 8 55 18 58 18
,44 18 47 18 118 18 36 18 18
1, 670
39 1240 DATA 18 216 18,248,13 4
,20 213 20 3,32 5 21 10 21,1
53  1029
6E 1250 DATA 21 168,21 58,20 63
 20 24 21 29 21 220 21 233 2
1 13  963
60 1260 DATA 193 63 63 63,77 86
 76 85 32 70,65,73 76 83 32
 73  1246
5C 1270 DATA 78 32 84 72 73 63
32 76 73,78 69 0 213,78 68 8
9  1178
5F 1280 DATA 70 73 78,69 68 32
211 85 77 66 73 76 32 157,82
 82  1381
0E 1290 DATA 78 68 0 210 69 68
69 70 73 78 69 68 32,211 85
77  1344
74 1300 DATA 66,78,76 32 197 82
 82 73 82 0 205 78 83,77 73
78  1361
0C 1310 DATA 73 67,32 78 79 84
32 82,69 67 73 71 76 73 83 6
8  1115
B4 1320 DATA 68,0 184 65 60 32
211,82 77 66 73 76 32 68 82,
 68  1250
C8 1330 DATA 79 82 0 201 76 76
69 71 65 76 32 207 80 69 82
65  1330
5C 1340 DATA 78 68 32 198 73 69
 78 68 0 201 76 76 69 71 65
76  1285
A3 1350 DATA 32,205 78 69 77 78
 78 73 67 32,198 73 69 76 68
0  1274
82 1360 DATA 205 73 83 83 73 78
 71,32 207 80 69 82 65 76 69
32  1375
75 1370 DATA 187 82 82 79 82 46
,0 136 73 83 75 32 158 73 76
83  1443
16 1380 DATA 32 157 82,82 79 82
,46 0 211 69 78 84 65 80 32
69  1316
0F 1390 DATA 82 82 73,82 46 0,8
01,76 76 69 71 65,76 32 208
85  1331
5B 1400 DATA 65 70 84 73 84 85
32,157 82 82 79 82 0 201 76
76  1380
AF 1410 DATA 69,71 65 76 32 133
 69 68 82 69 83,83 73 78 71
32  1213
42 1420 DATA 77,78 69 68 46 0,2
06 73 84 32 216 32 79,82 32,
217  1330
BD 1430 DATA 32,73 78 68 69 68
46 0 211,83,77 69,78 76 32 6
4  1156
80 1440 DATA 65 66 76 69 32 70
85,76 76 46 0 184 82 65,76 6
7  1147
F5 1450 DATA 72 32 210 85 78 71
 65 32 83,82 82 79 82,46 0,2
04  1373
0A 1460 DATA 73 78 76 70,73 78
68 32 76 65 77,69 32 76,69 7
8  1090
AD 1470 DATA 71 84 72 32 69 82
82 78,82 46 0 204 73 78 75,7
0  1188
FF 1480 DATA 73 76 69 32 70 65
77 65 32 77,73 83 83 73 70,7
1, 1109
AC 1490 DATA 46 0 184 65 68 32
66 73 82 69 67 84 73 86 69 3
2  1108
CB 1500 DATA 70 73 82 32 77 69
77,78 82 83 32 77 78 68 69 0
  1061
A2 1510 DATA 194 65 69 32 84 73
,82 83 67 84 73 86 65 32 70
73  1211
E8 1520 DATA 82,32 68 73 83 76
32 77 73,69 83 0 185 65 78 7
8  1184
E3 1530 DATA 75,84 32 78 80 65
78 32 65,78 75 84 72 69,82 3
2  1094
09 1540 DATA 76,73 78 75 70 73
76 69 0 200 79 32 83 65 67,7
2  1214
96 1550 DATA 32,83 65 76 65 67
84 32,67 75 65 63 32 70 78 8
2  1058
8D 1560 DATA 32,84 72 73 83 32,
69 63 82 73 67 69 46 0 196,6
5  1115
7E 1570 DATA 86,73 67 69 32,67,
73 77 77 85 70 73 67 85 84 7
3  1152
F9 1580 DATA 78,78 32 70,65 73
76 85 82 69 46 0 84 16 83 15
342
0E 1590 DATA 116,15 133 15,163
15,180 15,202 15 226 15 248
15 5 16  1403
F1 1600 DATA 23,16 46,16 71 16
93 16 108 16,120 16,156 16 1
73 16  926
FE 1610 DATA 209 16 237,15 10 1
7 32 17,123,112 3 240 82 130
10,72  1305
20 1620 DATA 173 27 8 201 1 208
3 76,7 18 238 56 3 208 3 83
8  1514
CB 1630 DATA 57,3 32 227,22 104
 170 142 23 8 189 78 17,168
163 77  1552
13 1640 DATA 17,170 32 50 22 16
3 13 32 177 33 173 55 5 240
3 17  1311
F6 1650 DATA 7 18 173,23 8 240
5 169 0 76 151,17 32 14 16 3
2  983
A4 1660 DATA 215 23 169 0 141 1
12,5 32 232 17 174 20 8 154,
96 138  1540
51 1670 DATA 10 170 189 78 17 1
68 189 77 17,170 32 50 22 16
3 13 32  1403
E2 1680 DATA 177 33 162 128 108
 0 3 173,35 5 208 1 96 162 8
0 160  1611
F0 1690 DATA 11,32 50 22 173 86
3 174 37 8 133 20 134 21,32
,45  1058
5E 1700 DATA 34,160,13 76 177 3
3 174 21 8 154,76 189 23 173
83 8  1428
D5 1710 DATA 240,10 165 2 32 18
5 255 165 3 32 205 255 169 4
,32 135  1357
0A 1720 DATA 255 96 32 208 23 3
2 133,32 76 215 23 165 1 44
169  1508
FC 1730 DATA 141 85 8 76 86 18
163 1,44 169,0 141 53 3 141
84  1283
EC 1740 DATA 3 76,65,18 173 83
3,240 7 162,249 160 10,76 80
,22  1423
3E 1750 DATA 162 14 160 11 76 5
0 22 173 95,3 240,7 162 65 1
60 11  1417
AC 1760 DATA 76,50 22 162 37 16
0 11 76 50 22 173 113 3 32,1
38 18  1150
4D 1770 DATA 140 179 3 142 180
3 173 114 3 32 133 18 140 20
5 3 142  1644
DD 1780 DATA 210 3 162 157 160
3 32 50 22 56 56 233 8,10 17
0 165  1573
43 1790 DATA 134 3 165 189 135
3 170 56,165,45,164 46,134,4
3,132 44,  1684
D8 1800 DATA 160 0 162 145 43 2
30 43 208 2 230 44 145 43 20
0 145 43  1833
55 1810 DATA 200 24 101 43 133
45 165 44 105 0 133 46 32 21
3 20 32  1338
AA 1820 DATA 85 169 162 232 160
11 32 50 22 168 8 141 113 9
141 114  1523
A4 1830 DATA 5 162 0,189 48 12
157,115 2 232 224 4,208 245
134 198  1543
0E 1840 DATA 108 2 3 165 166 16
2 80 141 2 3 142 3 3 169 243
162  1458
C6 1850 DATA 165 141,8 3 142 7
3 86 169 76 162 6,160 13 133
132  1421
C6 1860 DATA 134 133 132 134 96
201 42 240 7 56 233 48 56 2
38 208 96  2045
56 1870 DATA 141 96 8 142 85 5
140 100 8 162 0 142 101 8 16
0 0  1322
98 1880 DATA 185 184 14 240 65
56 241 122 240 19 233 128 24
0 13 165 164  2327
D0 1890 DATA 14 48 3 232 208 24
8 232 238 101 8 76 31,19,232
200 208  2035
42 1900 DATA 223 200 24 152 101
122 133 122 165,123 105 0 1
33 123 173 101  2000
B6 1910 DATA 5 10 170 189 19 15
141 100 19 189 18 15 141 10
1 19 32  1187
BE 1920 DATA 121 0,32 0 0 162 1
28 104 0 3 173 38,5,174 58 5
,116  1
67 1930 DATA 172 100 8 76 10 15
,189 10 162 0 133 9 134 4 16
8 43  1205
55 1940 DATA 166 44 133 251 134
252 160 1 177 251 208 1,96
200 165 9  2242
32 1950 DATA 145 251 200 165 4,
145 251 160 0 177 251 72 200
,177 251 133  2582
81 1960 DATA 252 104 133 251 16
8 10 24 101 3 133 3 165 4 10
5 0 133  1530
CD 1970 DATA 4 76 135 18 32 211
,21,165 7 174,116 9 169 32 1
66 255  1814
2A 1980 DATA 165 0 32 168 255 3
8 132 255 176 13 32 183 255
208 8 165  2186
B4 1990 DATA 7 141 105 8 76 228
18 169 7 32 195 255 169 0 1
41 105  1655
F2 2000 DATA 8 76 228 19 173 10
5 8 208 7 162 131 160 11 76
50 22  1507
2C 2010 DATA 162 212 160 11 76
50 22 32 228 18 32 68 18,32
96 18  1230
CF 2020 DATA 76 107,18,162 0 18
8 154,14 208 8 169 13 76 177
,33 18  1459
B4 2030 DATA 8 32 177 33 232 20
8 238 41 127 32,177,33 168 1
3 32 177  1727
1D 2040 DATA 33 232 208 225 96,
169 15 168 32 186 255 169 0
32 168 255  2264
B3 2050 DATA 32 192 255 144 3 7
6 103 21 96 174 114 8 208 3,
174 113  1723
0F 2060 DATA 8 32 38 20 32 121
0 201 34 208 78 160,0,200 17
7 120  1432
5B 2070 DATA 240 8,201 13 240 4
,201 34 208 243 169 0 145 12
2 165 122  2115
76 2080 DATA 24 105 1 72,165 12
3 105 0 72 24 152 101 122 13
3 122 165  1486
35 2090 DATA 123 105 0 133 123
,162 15 32 201 255 104 168 10
4 170 173 105  1573
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4F  2310 DATA 121 17 32,173 21 1
    65 3 201 4 144 242 201 6 176
    238 141  1981
6D  2320 DATA 118 5 96 169 147 7
    5,210 255,162 52 160 12 76 5
    0 22 169  1781
5C  2330 DATA 156 162 18 133 20
    134,21 162,0 160,8 185 235 8
    205 20  1815
9F  2340 DATA 208 3 136 16 246 1
    60 3 177 20 24 96,232 224 66
    176 250  2043
DD  2350 DATA 165 20 105 4 133 2
    0 165 21 105 0 133 21 24 144
    218 173  1451
0E  2360 DATA 234 8 201 3,240 5
    162 3 76,121 17 32 240 21 17
    6 246  1785
D6  2370 DATA 96 134 20 132 21 1
    60 0 177 20 240 6 32,177 33,
    200 208  1656
B8  2380 DATA 246 96 201 65 144
    6,201 91 176 2 56 96 24 96 2
    01 48  1749
4C  2390 DATA 144 240 201 58 176
    246 144 242 32 67 22 176 23
    7 76 79 22  2178
59  2400 DATA 32 79 22,176 229 2
    01 65 144 227 201 71 176 223
    144 219 134  2343
18  2410 DATA 20 138 21 160 0 17
    7 20 32 177 33 200 201,13 20
    8 245 96  1736
5A  2420 DATA 162 42 160 8 76 11
    3 22 201 10 176 3 5 48 96 10
    5 54  1284
C7  2430 DATA 96 72 74 74 74 74
    32 136 22 32 177 33 104 41 1
    5 32  1088
15  2440 DATA 136 22 76 177 33 1
    73 113 5 32 148 22 173 118 5
    ,32 148  1423
F1  2450 DATA 22 154 32 32,177 3
    3 173 121 9 32 146 22 173 12
    0 5 76  1346
1B  2460 DATA 146 22 32 166 22 1
    02 1 32 29 34 32 201 33 173
    40 8  1153
B2  2470 DATA 174 41 8 133 20 13
    4 21 32 30 34 162 1 32 25 34
    76  965
DF  2480 DATA 129 22 169 15 32 1
    77 33 32 135 22 169 146 76 1
    77 33 173  1603
6B  2490 DATA 94,5,206 2 240 75
    165 42 162 8 133 20 134 21 1
    74 102  1597
6D  2100 DATA 5,72 165 0 141 105
    3,32,50,22 104 141 105 5 32
    204, 1204
81  2110 DATA 255 32 243 20 165
    15 76 195 255 162 8,160 16 3
    2 50 22  1711
D3  2120 DATA 160 13 76 177 33 3
    2 50 165 134 122 132 123 32
    115 0 170  1583
8D  2130 DATA 240,243 162 255 13
    4 56 144 6 32 181 165 76 225
    167 32 107  2167
6F  2140 DATA 169 166 122,160 4
    189 0 2 232 200 153 851 1 20
    1 0,208  2056
3E  2150 DATA 244 76 162 104 165
    0 141 112 5 141 105 5 141 5
    4,5,141  1717
C5  2160 DATA 33 5 141 5 5 32 2
    45 16 32 228 16 32 204 255 3
    2,231  1641
05  2170 DATA 255,96 162 15 32 1
    64 255 32 228 255 32 210 255
    ,201 13,208  2447
20  2180 DATA 246 76 204 255 174
    113 3 208 3 174 114 9 32 36
    ,20 32  1707
C8  2190 DATA 243 20 169 15 76 1
    95 255 174 113,5 208 3 174 1
    14 5 160  1946
17  2200 DATA 2 160 0 32 180 255
    165,1 162 133 160 5 32 183,
    255 32  1777
7D  2210 DATA 182 255 176 56 32
    183 255 208 51 32 117 2 76
    46 32 117  1545
E7  2220 DATA 21,176 36 32 117 2
    1 133 20,134 21 32 45 34 162
    1,32  1017
BC  2230 DATA 25 34 32 135 21 20
    1 0 240 6 32 177 33 76 83 21
    168  1203
0F  2240 DATA 13 32 177 33 76 63
    21 169 2 76 195 255 32,104
    21 162  1431
45  2250 DATA 21 76 121 17 32 13
    5 81 176 12 141 117 5 32 135
    21 176  1242
3A  2260 DATA 4 170 173 117 5 56
    ,162,2 32 198 255 32 228 255
    160 32  1533
69  2270 DATA 183 255 8 32 204 8
    56 152 40 208 2 24 56 50 56
    32 175  1882
EF  2280 DATA 21 32 135 21 141 1
    13 5 56 32 175 21 32 135 21
    141 114  1353
5E  2290 DATA 9 56 165 122 168 1
    23 133 251 134 252 32 82 26
    165 4 208  1548
F0  2300 DATA 12 56 165 3 201 8
    144 5 201 12 176 1 96 162 20
    76  1378
70  2500 DATA 5 32 158 255 32 22
    8 255 141 38 8 32 228 255 14
    1 36 4  1683
69  2510 DATA 208 10,173 38 8 20
    5 5 32 204 255 96 96 32 226
    255 141  1343
4C  2520 DATA 40 4 32 228 255 14
    1 41 4 38,228 255 201 0 240
    13 160  1882
80  2530 DATA 0 145 20 230 20,20
    4 241 230 21 76 41 23 169 13
    ,145 20, 1602
8F  2540 DATA 32 204 255 24,36 1
    60 0 177 73,153 38 8 200,152
    4 144  1760
80  2550 DATA 246 173 38,4 208 7
    173 39 4 208,2 56 96 177 73
    240  1752
7E  2560 DATA 5 153 38 4 200 208
    246 165 13 153 38 4 173 38
    8 174  1633
95  2570 DATA 39 4,132 73 134 74
    24 56 173 26 8 240 1 56 162
    4  1288
34  2580 DATA 76 121 17 169 0 13
    3 71 133 72 133 63 133 64 14
    1 118 5  1453
53  2590 DATA 141 119 5 141 120
    5 14 121 5 56 32 132 23 141
    76 5  1339
82  2600 DATA 141 57 5 141 103 5
    141 59 5 141 34 8 141 35 8
    141  1216
D5  2610 DATA 59 5 165 8 141 102
    5 165 45 166 46 133 69 134
    70 160  1479
71  2620 DATA 0 152 145 69 162 4
    8 160 10 32 60 22 32 206 23
    96 165  1375
58  2630 DATA 1 41 254 133 1 96
    165 1 5 1 133 1 96 169 0 141
    1242
3B  2640 DATA 234 8 160 0 32 207
    255 201 13 240 6 153,235 8,
    200 208  2160
34  2650 DATA 243 140 234 8 96 1
    62 213 160 8 32 60 22 32 222
    23 173  1388
53  2660 DATA 234 8 208 10,162 2
    37,160 5 32 60 22 76 185 17
    20,13  1628
F7  2670 DATA 144 10 162 11 160
    10 32 60 22 76,240 23 160 0
    185 154  1445
F3  2680 DATA 8 153 202 8 200 19
    2 3 208 245 162 0 189 235 8
    157 170  2141
88  2690 DATA 8 153 202 8 232 20
    0 236 234 8 208 240 169 7 8
    9 142 5  2231
F6  2700 DATA 153 208 8 232 20
    224 8 208 241 140 7 8 74
    34,8 160  2240
57  2710 DATA 0 185 150 8 157 17
    0 8 200 232 152 4 208 244 14
    6 36 8  1845
D8  2720 DATA 96 173 54 8 240 8
    206 8 185 43 166 44 133 73 1
    34 74  1683
0E  2730 DATA 56 173 102 8 168 1
    74 113 8 32 186 255 173 36 8
    162 170  1865
61  2740 DATA 160 8 32 80 33 32
    189 255 32 192 255 176 80 17
    4 102 8  1815
EC  2750 DATA 32 159 255 176 82
    32 228 255 32 193 255 208 74
    32 228 255  2525
7   2760 DATA 32 193 255 208 66
    32 204 255 32 173 33 8 240 5
    6 165 3  2074
80  2770 DATA 165 174 114 8 32
    86 255 173 37 8 162 202 60
    8 32 189  1909
4A  2780 DATA 255 32 192 255 176
    33 162 3 32 201 255 176 26
    173 34 8  2013
DD  2790 DATA 32 210,255 32 183
    255 208 15 173 36 8 32 210 2
    55 32 183  2118
32  2800 DATA 255 208 4 32 204 2
    55 96 32 204 255 169 16 76 1
    51 17 173  2147
B5  2810 DATA 27 8 9 48 141 151
    10 162 134 160 10 32 50 22 7
    8 88  1128
09  2820 DATA 33 230 251 208 2 2
    30,252 140 23 8 160 0 177 85
    1 172 23  2160
E4  2830 DATA 0,96 169,251 165 2
    51 201 255 206 2 169 252 96
    32 15 85  2257
EB  2840 DATA 168 0 170 ,41 234
    8 32 2 25 32,80 22 176 4 162
    234  1480
1C  2850 DATA 8,96 157 235 8 232
    208 83 32,2 25 32 8 25 201
    32  1535
E8  2860 DATA 240,246 96 165 45
    166 46 133 5 134 6 160 0 177
    5,208  1822
1D  2870 DATA 2 24 96 205 234 8
    208 40 168 0 200 200 200,200
    177 5  1561
2B  2880 DATA 201 235 8 208 27 2
    32 83 234 8 144 242 160 1 1
    77 5 141  2278
58  2890 DATA 25,8 200 177 5 141
    24 8 200,177 5 141 25 8 56
    96  1257
C5  2900 DATA 160 0 177,5 24 105
    4 101 5 133 5 144 2 230 6 7
    6  1177
96  2910 DATA 76 25 32 2 25 32 3
    0 25 173 234 8 208 5,162 4 7
    6  1117
77  2920 DATA 121,17 32 69 25 14
    4 12 162 2 173,27 8 201 1 20
    0 5  1805
F8  2930 DATA 76 121 17,162 0 16
    9 1 141 28 8 224 0 240 1 96
    169  1444
FA  2940 DATA 0,173 234 8 145 69
    200 168 2 145 69 200,165 71
    145 69  1864
AE  2950 DATA 200 165 72 145 69
    200 162 0 189 235 8 145 69 2
    32 200 236  2327
4E  2960 DATA 234 8 208 244 152
    24 101 69 133 69 165 70 105
    0 133 70,  1785
87  2970 DATA 201 192 208 5 162
    19 76 121 17 160 0 152 145 6
    9,56 169  1765
13  2980 DATA 0 133 3 133 4 32 2
    ,25 32 87 22,176 1 96 201 65
    ,  1022
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51 2580 DATA 178 4 41 15,144 2
   233 55 24 6 3 3E 4 178 26 6
   952
5A 3000 DATA 3 3E 4 178 18 6 3
   3E 4,176 19 6 3 3E 4 176  70
   7
7C 3010 DATA 7 5 3 133 3 78 6 2
   6 162 10 76 121 17 185 0 133
   , 347
11 3020 DATA 3 133 4 32 19 26 3
   2 2 25 32 78,22 175 1 36,41
   723
05 3030 DATA 15 72 165 4 72 165
   ,3 72 6 3 3E 4,176 21 6 3,
   1022
06 3040 DATA 3E 4 176 218,24 10
   4 101 3,133 3 104 101 4 133
   4,176  1320
19 3050 DATA 190 6 3 3E 4 176 1
   93 104 24 101 3 133 3 165 4
   105  1251
37 3060 DATA 0 133 4 176 178 14
   4 181, 32 2 25 133 3 165 0 13
   3 4  1328
C4 3070 DATA 32 2 25,201 35 240
    5,162 8 78 121 17 78 2 25 7
   6  1107
D7 3080 DATA 183 25 173 25 9 24
   0 36 201 60,240 4 165 4 133
   3 163  1574
F6 3090 DATA 0 133 4 76 204 26
   32 5 25,201 13 240 223,201,4
   0 240  1672
CE 3100 DATA 225 201 41 240 221
   ,201 44,240 217 208,15 165 1
   141 31 8  2203
35 3110 DATA 165 4 240 5 165 2
   141 31 8 36 201 43 240 4 201
   45  1535
1B 3120 DATA 208 72 173 30 8 24
   0 5,162 8 76 121,17 23H 30 8
   165  1562
A1 3130 DATA 4 72,165 3 72,32 8
   25 72 32 2 25,32 160 26 104
   634
AA 3140 DATA 201 43,240 24 165
   3,184 4 104,133 3 104 133 4,
   56 130  1920
BD 3150 DATA 228 3 133 3 152 22
   8 4 133,4,76,160 26 24,104 1
   01 3  1394
A3 3160 DATA 133 3 104,101 4 13
   3 4 76 160 26,162 0 142,30 8
   201,  1257
20 3170 DATA 60 240 4,201 62 20
   8,8 141 29 8 32 2 25 201 35
   208  1456
67 3180 DATA 6,32 136 26 76 160
   26 32 67 22 144 54 32 30 25
   32  800
BD 3190 DATA 68 25 176 25 ,33 1
   141 32 8 ,73 27 8 201 2 208
   5  1259
EC 3200 DATA 162 1 76 121 17 16
   8 2 141 31 8 76 160,27 165 0
   173  1332
5E 3210 DATA 24 8 133 3 173 25
   8,133,4 173 26 8 141 31,8,76
   ,974
BG 3220 DATA 160 25 201,36 240
   4 201 38 208 8 32 0 26 76 16
   0 26  1440
5E 3230 DATA 32,79 22 144 8 32
   52 26 76 160 26 162,5 76 121
   17  1045
21 3240 DATA 230 71,208 2 230 7
   2 230 63,208 2,230 64 96 173
   ,93 3  1381
C5 3250 DATA 240 5 162 3,32 201
   255 173 33 8 32 158 34 32 2
   35 27  1630
3F 3260 DATA 32 161,27 172,31 8
   240 25,165 3,32,158 34 32 2
   35 27  1382
BO 3270 DATA 32,161 27 136 240
   11 165 4 32 158 34 32 235 27
   ,32 161  1487
AC 3280 DATA 27 173 33,8 240 3
   32,204 255 56 174 27 6 224 2
   240  1807
54 3290 DATA 1 36 174 63 6 240
   12,32 210 255 32 165,255 240
   3 76  1511
45 3300 DATA 232,24,56 140 23 8
   160 0 145 63 172 23 8 96 14
   1 33  1364
4B 3310 DATA 8 165 0 141 31 8 7
   5 174 27 141,33 8,32 160 26
   173  1207
CO 3320 DATA 27,8 201 1 240 58
   173 31 8 201,1,240 51 165,71
   ,24  1500
14 3330 DATA 105 2 170 165 72 1
   05 0 168 165,3,134 3 165 4 1
   32 4  1338
36 3340 DATA 56,229 3 133 3 138
   ,229 4 133 4,201 255 240 12
   201 0  1841
0E 3350 DATA 208 22 165 3 201 1
   27 176 15 144 6 165 3 201 12
   8 144 8  1717
4A 3360 DATA 169 1 141 31 8 76
   174 27 162 14 78 121 17 141,
   33,8  1189
17 3370 DATA 24,105 164,133 253
   ,169 13 105 0 133 254 32,8 2
   5 201,65  1504
2D 3380 DATA 208,24 160 1 177 2
   51,201 13 240 4,201 32 208,1
   2 32 2  1785
83 3390 DATA 25,165 0 141,31 8
   169 76 133 25 32 8 25,201 36
   ,208  1254
AB 3400 DATA 33,32 2 25 32 160
   26,173 32 8 240,5 165 1 141
   31  1110
5E 3410 DATA 8 173 31,8,201 1 2
   40 5 162 10 76 121 17 160 1
   76  1230
1D 3420 DATA 138,29 201 40 240
   61 32 180 26 173 32 8 240 5
   165 2  1578
OH 3430 DATA 141 31 8 173,31 8
   201 1 208 2 160 2 201 2 208
   2  1373
13 3440 DATA 160 5 173 33 8 201
   110 240 4 201 121 208 2 160
   5 132,  1823
34 3450 DATA 5 208 5 165 2 141
   31 8 32 8,25,201 41,240 3 76
   1158
40 3460 DATA 138,29,32 2,25 201
   88 240,10 201 89 240 5 162
   12,75  1550
C3 3470 DATA 121 17 200 200,76
   133 25 32,2 25 32 160 25 32
   8 25  1123
B4 3480 DATA 201 41 240 53 173
   32 8 240,5,169,1 141 31 8 17
   3,31  1647
8F 3490 DATA 8 201 1 240 5 162
   10 76,121 17,32,8,25 201 44
   240,  1351
77 3500 DATA 5 162 5 76 121 17
   32 2 25 201 88 208 244 32 2
   25  1284
D5 3510 DATA 201 41 200 237 160
   ,76 138,25,32 2 25 201 44
   240,10  1652
17 3520 DATA 165 2 141 31 8 160
   10 76 138 29 173 32 8 240 5
   165  1531
CB 3530 DATA 1,141 31 8,173 31
   8 201 1 240 5 162 10 76 121
   17  1228
F7 3540 DATA 32 2 25 201 88 208
   ,185 160 8,177 253 201,256 2
   40 8 141  2165
C3 3550 DATA 33,8 76 174 27 162
   11,76 121 17 224,56 144 3,7
   6 34  1302
18 3560 DATA 30,224 33 144 3 76
   110,2F 224 25,144 3 76 2F 2
   8 76  1250
9G 3570 DATA 15,28 32 132 23 32
   240 24 185 142,21 8 32 225
   255 208  1603
1E 3580 DATA 3 76 144 33,32 240
   22 8 169 42 162 8 134 251 1
   34,252  1708
82 3590 DATA 32 19 25 40 144,31
   173 103 8 208 1 56 173 102
   8 32  1197
D6 3600 DATA 195 255 168 0 141
   103 8 165 2 141 102,8,173 10
   4 8 141  1722
53 3610 DATA 54 5 76 52 30 165
   0 141 28 8 141 29,8 141 30 8
   554
72 3620 DATA 141 32 8 32 134 34
   32 57 25 201 59 240 38 201
   4F 208  1388
AB 3630 DATA 6 32 147 25 32 60
   25 201 13 240 24 32 67 22 17
   5 5  1107
CE 3640 DATA 162 6 76 121 17 32
   30 25 32 32 22 72 32 60 25
   104  948
C1 3650 DATA 32 155 25 173 27 8
   201 2 208 11 173,38 8 240,3
   ,32  1351
8F 3660 DATA 195 22 32 73 30 76
   185 23 195 71 166 72 141 11
   8 8 142  1530
14 3670 DATA 115 9 165 67 166 6
   4 141 180 8 142 181 9 96 224
   ,56 208  1712
40 3680 DATA 3 76 24 31 224 57
   208 3 76 37 31 224 58 208 3
   76  1339
F3 3690 DATA 189 31 224 59 208
   3 76 173 31 224 60 208 3 76
   252 30  1777
49 3700 DATA 224 61 208 3 76 17
   2 30 224 62 208 3 76 180 30
   224 63  1824
43 3710 DATA 208 3 76 188 30 22
   4 64 208 3 76 231 32 76 119
   33 165  1718
BC 3720 DATA 1 141 59 8 96 165
   1 141 53 8,56 32 60 25 32 16
   0 106  1066
BE 3730 DATA 28 173 63 8 240 6
   162 3,32 201 255 169 0 166 5
   ,184  1701
2F 3740 DATA 4 208 224 255,208
   14 136 152 255 208 8,173 33
   5 240 3  2225
AB 3750 DATA 32 204 255 56 32 2
   22 30 32 161 27 76 184 30 17
   3 27 8  1559
CB 3760 DATA 201 2 240 1 56 173
   ,33 8 240 5 165 0 76 210,255
   ,140  1310
C2 3770 DATA 23 8 160 0 152 145
   63 172 23 8 96 32 60 25 32
   160  1 55
0E 3780 DATA 25 165 3 166 4 133
   71 134 72 133 63 134 64,141
   34 8  1351
61 3790 DATA 142 35 8 96 32 57,
   25 32 60 25 201 38 240,35 32
   ,160  1213
22 3800 DATA 26 165 4 240 5 162
   10 76 121 17 32 37 32 32,16
   1 27  1147
52 3810 DATA 32 60 25 201 44,24
   0 22, 201 13 208 1 96 162 8
   76 121  1710
31 3820 DATA 17 32 2 25 201 0 2
   40 244 201 33 240 11 133 3 3
   2,37  1457
B5 3830 DATA 32 32 161 27 76,66
   ,31 32 2 25 76 48 31 32 57,2
   5  754
72 3840 DATA 32 60 25 32 160 26
   ,32 48 32,32 161 27 32 161 2
   7 32  815
25 3850 DATA 60 25 201 44 240 2
   31 201 13 208 1 96 162 9,76
   121 17  1705
7B 3860 DATA 32 121 23 165 5 72
   ,165 5 72 32 160 26 104 133
   5 104  1225
E7 3870 DATA 133 8 165 4 240 5
   162 10 76 121,17 160 1 169 1
   145  1415
```

```
68  3880 DATA 5,200,185,3,140,5
    200,165,4,145,5,96,32,121,23
    165  1479
5E  3890 DATA 5,72,165,6,72,32,1
    60,25,104,133,6,104,133,5,16
    0,1  1184
6D  3900 DATA 169,2,76,160,31,16
    6,142,20,8,32,155,23,169,1,1
    41,112  1427
4B  3910 DATA 8,32,194,33,173,83
    ,5,13,64,8,240,3,32,246,23,1
    69  1332
75  3920 DATA 1,141,27,8,32,88,2
    4,32,173,23,32,14,18,238,27
    ,8,60  1
52  3930 DATA 32,98,24,32,170,24
    ,32,173,23,32,3,32,32,127,32
    ,75,554
DE  3940 DATA 188,17,162,162,160
    ,10,32,80,22,173,35,8,32,146
    ,22,173  1333
E6  3950 DATA 34,9,32,146,22,162
    ,159,160,10,32,80,22,32,106,
    22,165  1266
27  3960 DATA 13,76,177,33,169,1
    ,141,31,8,76,50,32,165,2,141
    ,31  1150
27  3970 DATA 8,173,33,8,240,48,
    206,8,173,27,8,201,2,240,1,9
    6  1518
83  3980 DATA 162,3,32,201,255,1
    72,31,8,165,3,32,158,34,32,2
    10,255  1753
CA  3990 DATA 136,240,8,169,4,32
    ,158,34,32,210,255,76,204,25
    5,173,27  2009
30  4000 DATA 8,201,2,240,1,96,1
    79,31,8,185,3,32,158,34,160,
    0  1313
D1  4010 DATA 145,63,200,202,240
    ,7,165,4,32,158,34,145,63,96
    ,173,59  1757
56  4020 DATA 5,208,1,96,169,217
    ,160,10,32,80,22,165,45,166,
    46,132  1522
E8  4030 DATA 5,134,6,160,0,177,
    5,208,1,56,141,23,8,184,0,20
    0  1326
F4  4040 DATA 200,200,200,177,5
    ,32,177,33,232,236,23,8,208,2
    ,41,169,32,217,
CF  4050 DATA 32,177,33,169,32,9
    2,177,33,160,1,17,5,160,0,2
    01,1  1397
12  4060 DATA 240,5,177,6,32,146
    ,22,136,177,5,32,146,22,160,
    0,177  1482
E4  4070 DATA 5,24,105,4,101,5,1
    33,5,165,6,105,0,133,6,169,1
    ,3  879
D4  4080 DATA 32,177,33,76,146,3
    2,173,103,9,240,5,162,19,76,
    121,17  1423
FD  4090 DATA 32,80,25,201,34,20
    ,9,70,162,0,32,2,25,201,34,24
    ,0,10  1336
A5  4100 DATA 157,50,8,232,224,1
    ,5,144,241,176,54,142,82,9,16
    ,9,141  187D
34  4110 DATA 102,9,141,103,9,17
    ,84,9,141,104,9,169,1,141,9
    ,8  1306
27  4120 DATA 173,102,9,164,174,
    113,9,32,186,255,173,82,9,16
    ,2,60,169  1677
BC  4130 DATA 8,32,80,33,32,189
    ,255,32,80,33,76,137,24,162,1
    ,5,44  1241
6A  4140 DATA 162,16,189,2,141,1
    82,9,169,0,141,183,9,76,121,
    17,141  1378
96  4150 DATA 23,8,134,3,132,4,9
    ,6,173,84,9,201,1,96,162,234
    ,160  1537
EC  4160 DATA 10,32,50,22,150,0,
    177,3,32,177,33,200,209,23,8
    ,208  1339
A0  4170 DATA 246,169,13,76,177,
    33,173,82,8,240,5,162,16,76,
    121,17  1627
BC  4180 DATA 30,80,25,32,150,25
    ,165,3,168,4,133,63,134,64,9
    ,6,162  1325
C8  4190 DATA 119,160,11,32,50,2
    ,76,183,17,173,83,9,240,1,8
    ,6,160  1448
E4  4200 DATA 1,177,43,240,1,96
    ,162,15,160,11,32,50,22,76,1
    ,22,17  1495
F0  4210 DATA 141,105,9,173,105
    ,9,240,30,142,107,9,140,108,9
    ,162,7  1497
DA  4220 DATA 32,201,255,173,106
    ,9,32,210,255,32,204,255,173,
    108,9,174  2226
98  4230 DATA 107,9,172,108,9,56
    ,173,106,9,76,210,255,173,11
    5,9,240  1867
A1  4240 DATA 14,206,115,9,173,1
    09,9,240,16,22,162,1,32,29,9
    4,172  1285
F2  4250 DATA 115,9,240,30,173,1
    10,9,32,146,22,162,1,32,29,9
    4,196  1280
5E  4260 DATA 240,21,173,111,9,2
    2,146,22,162,1,76,29,94,162
    ,32,  1259
AF  4270 DATA 29,94,162,3,32,29
    ,94,162,3,76,29,94,169,32,32
    ,177  1037
8E  4280 DATA 33,202,208,250,36
    ,162,0,142,122,9,240,3,162,1
    ,142,122  130D
50  4290 DATA 9,202,142,123,9,16
    ,0,0,56,200,165,20,233,125,5
    ,133,20  1626
C8  4300 DATA 165,21,233,126,8,1
    33,21,176,239,136,165,20,125
    ,125,9,133  1956
F4  4310 DATA 20,165,21,125,126
    ,9,133,21,162,141,124,9,201,0
    ,208,13  1488
70  4320 DATA 173,122,9,240,5,17
    3,123,9,240,13,173,124,9,9,4
    6,32  1502
1A  4330 DATA 177,33,169,1,141,1
    23,9,232,232,224,8,208,184,1
    69,80,9  1835
AA  4340 DATA 44,32,177,33,96,16
    9,244,141,33,8,133,3,133,4,1
    41,105  1454
85  4350 DATA 9,141,110,9,141,11
    1,9,169,0,141,115,9,96,142,2
    2,8  1232
E1  4360 DATA 174,115,9,224,8,24
    0,7,157,105,9,232,142,115,9
    ,174,22  1741
CA  4370 DATA 9,96,0,0,0,0,0,0,0
    ,0,0,0,0,0,0,0  104
```

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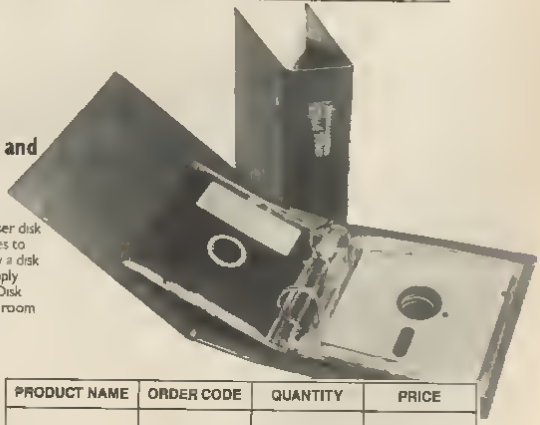

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Extending Basic

Declaring and using labels in Basic is not as difficult as it may seem

By Burghard-Henry Lehmann

One advantage of writing machine code programs with an assembler is that you can declare labels for jumps and branches An example of this is "Speedy Assembler" written by yours truly, and still available from Readers' Services for everybody who wants to get into serious machine code programming!

Instead of having to give jumps and subroutine calls as absolute addresses, and having to calculate relative branches, you simply declare a label on the left-hand side at the start of the routine to be jumped or branched to, and the assembler does the rest It stores the label in what is called "the symbol table" with the address of the location at that point next to it

Later on when it finds that label next to a jump or branch instruction it fetches the address from the symbol table and in case of a jump or subroutine call assembles it as the location to be jumped or to be called or, in the case of a branch instruction calcalates the length of the branch The programmer doesn't have to trouble himself with any of this Nor does he have to go to the trouble of calculating branches Instead he just attaches a name to the routine or subroutine in question

And what's more labels like this add tremendously to the readability of the program, because you can give each routine and subroutine a name that suits you This helps quite a bit when a bug has developed in the program (and doesn't it always!), and the programmer has to spend ages finding it!

Labels in Basic

Because of all this, I felt for a long time that it would be nice to be able to use labels like this in Basic programs too No more memorizing of line numbers, and, most of all, no more renumbering of GOTO's and GOSUB's whenever one changes the program

It is actually surprisingly easy to introduce such a facility to the rather poverty-stricken Commodore 64 Basic In the last article of this series we've developed a routine which allows us to give GOTO and GOSUB with variable names So we've already got the basic facility to labelize jumps and subroutine calls, but we still have to declare the value of the label at the beginning of the program with a line like 'Subroutine = 1000" To do this job for us, the computer has to build a symbol table of sorts, and this has to be done before the program is actually run This is because during execution, when a GOTO or GOSUB is encountered, the computer has to know where to jump to

You may know that most assemblers are called "Two Pass Assemblers" This is because in order to deal with jumps and branches, the assembler has to do its job in two gos First it goes through the whole of the textfile and builds the symbol table, and then it has a second go in which it is able to assemble the source in earnest

To use labels to the full in Basic we have to do a similar thing Before the program is run in earnest, the computer has to sift through the whole of the textfile and collect all the line numbers to which it has to GOTO and GOSUB later on This means that it

Figure 1

```
A871    BasicRun    PHP             Save status register
A872                LDA  0          This is direct run mode
A874                JSR $FF90       Set Kernal flags to direct run mode
A877                PLP             Retrieve status register
A878                BNE LineNo      If Z 0 then RUN plus line number
A87A                JMP             Do CLR and start program

A87D    LineNo      JSR $A660       Do CLR
A880                JMP $A897       Jump to GOTO and starT program
```

takes a bit of time until running proper starts. But I don't think that this is a major handicap, and it certainly is worth it!

Running a Basic Program

So we have to intercept the RUN command. To do this let's look first of all a bit closer at what it does under normal circumstances.

After you've typed in your Basic program and then given the RUN command to execute your program, the Basic interpreter jumps to the routine at $A871. Figure 1 gives you a disassembly of that routine.

First the flag register is saved on the stack. Then a call to a Kernal routine is made. This routine puts the computer into the direct run mode by loading the system variable $9D with zero and setting ST, which is the status variable.

Then the flag register is pulled from the stack again. If the zero flag equals one, that is if the last value in the accumulator has been zero, then there were no parameters with the RUN command. In this case the routine continues, otherwise it branches forward because a line number has been given with RUN.

If no line number is given with RUN the routine jumps to the CLR routine and doesn't return. If a line number has been given with RUN the routine calls on the CLR routine and then jumps to the GOTO routine, because in the end RUN 100 is similar to GOTO 100. The only difference is that RUN clears all the Basic variables, while GOTO leaves them untouched.

The CLR routine clears all the Basic variables and gives Basic a fresh start, so that variables and arrays can be built up anew. This is mainly done by setting the string storage pointer and the array storage pointer to the end of the Basic textfile because, as you might know, Basic stores all the variables and arrays declared in a program directly after the end of the textfile.

Modified RUN

Our modified RUN routine starts at line 1520 (Listing 1). First we deal with the RUN command more or less in the same way as the ROM routine. That is, we set the Kernal flags to the direct run mode (line 1520-1530), and then we clear the Basic variables (line 1540).

I haven't bothered about RUN line number, so this won't work with the routine as it is. If you give a line number with RUN, it will just be ignored. But nevertheless, if you do want this little-used facility it shouldn't be impossible for you to add it with the help of the explanation of the normal RUN routine, which I've given above.

Next, we set zero page 254, 255 to the start of the Basic textfile (line 1580-1610). Zero page locations 251 to 255 are never used by the Commodore operating system, so these locations are absolutely safe to be used for your own purposes. There are many other zero page locations which are used by the Kernal or the Basic interpreter, but which are usually quite safe to use. For example, if you don't do any floating point arithmetic, you may use locations $61 to $6F without any trouble. But the point is always to think before you use a zero page variable, otherwise the system might do very funny things indeed!

After that we go into the main loop (SEARCHLP) which looks at each Basic line to see if it contains a label (line 1630-1810). To understand SEARCHLP here is a short explanation of how a Basic line is stored in memory.

First of all the line number is given in the usual low byte/high byte fashion. Next there are two bytes which contain the so called link pointer. Each link pointer points to the beginning of the next line. This makes it very easy to search through a Basic textfile, because you just have to jump from one link pointer to the other each time looking at the line number preceding it and in next to no time you've found the line you're looking for.

Each Basic line is finished with a zero, which is the standard terminator used by Commodore (strings too are always terminated with zero!). At the end of the textfile there will be two zeros in the locations where otherwise the next line number would be. So this is how the computer will know when it has reached the end of the textfile.

If you look at SEARCHLP in our program you'll find the routine testing for those two zeros right at the beginning of the loop (line 1630-1680).

Declaring a Label

Naturally we have to tell the computer when it has found a label. For that we have to make a label stand out in some way.

To do this I have chosen the following way of declaring a label: a label has to be at the beginning of a line, after the line number, and it has to be preceded by a full stop. Of course, you are free to experiment with methods which might suit you better, because this is the whole purpose of this series of articles: to enable you to develop extended Basic routines which suit your particular needs!

Anyhow, in the routine given, the computer looks for a full stop and that tells him that it has found a label (line 1690-1720). So it jumps to the routine which I called LABLFOUND. First of all the current location in the textfile is saved in $7A, 7B so that afterwards the computer can continue searching the texFile for more labels (line 1960-1990).

Then it goes forward five bytes to point at the label itself (line 2000-2060). Remember, all we are doing here is a simple LET operation, like, "LET LABEL = 1000" (or "LABEL = 1000" if you omit the LET). So the next ROM routine ($B08B) we call validates our label, that is, finds out if it is a permitted variable name (as you know, a valid Basic variable name has to start with a letter).

If the name is valid, the first two characters of it are stored in the variable area, which starts immediately after the end of the Basic textfile. On return from $B08B, the low byte of the variable location is in the accumulator, and the high byte is in the Y-Register. We store this in zero page $49, 4A which is the system variable pointer (line 2110-2120).

Next we get the line number and store it in zero page $62/63, which is the floating point accumulator # 1 (line 2160-2210). The next routine ($B399) which we call converts the line number into a proper floating point number (line 2250). We have to do it in this rather roundabout way because variables of this type have to be stored as floating point numbers in order to be recognized later on!

Finally we call $BBD0 (line 2260), which stores the value contained in flp accu # 1 in the variable area itself. Now our label has been stored like any other Basic variable in the variable store, including the number of the line on which it appeared. We can return to our main search loop and look for the next label.

The fact that each of the labels we

declare is stored like any other Basic variable means of course that only the first two characters of the label will be recognized The rest of the label is ignored, which limits the use of labels rather, because it doesn't give much scope for declaring meaningful names which are recognized

Therefore, in the next article I'd like to develop a routine which builds and recognizes a symbol table away from the Basic variable area This will enable us to declare labels with six or more characters which are fully recognized

Listing 1

```
10              ORG 48152
20              ENT
30              ,
40    CHARGET   EQU $0073
50    EXECVECT  EQU $0308
60              ,
70              ,
80              ,
90              ,TURN EXTENDED BASIC ON
100             ,BY CHANGING VECTOR AT $030
110             ,
120   EXTBASON  LDA # PRGSTART
130             STA EXECVECT
140             LDA #>PRGSTART
150             STA >EXECVECT
160
170             RTS
180             ,
190             ,
200             ,
210             ,TURN EXTENDED BASIC OFF
220             ,BY CHANGING VECTOR AT $0308
230             ,BACK TO NORMAL ($A7E4)
240             ,
250   EXTBASOFF LDA #<$A7E4
260             STA <EXECVECT
270             LDA # $A7E4
280             STA >EXECVECT
290             ,
300             RTS
310             ,
320             ,
330             ,
340             ,*** MAIN PROGRAM ENTRY ***
350             ,
360             ,LOOK FOR EXTENDED BASIC COMMANDS
370             ,
380   PRGSTART  JSR CHARGET
390             JSR EXECSTM
400             JMP $A7AE
410             ,
420             ,
430   EXECSTM   CMP 'O
440             BNE NEXT
450             JMP OFF RT
460   NEXT      CMP #$89        ,GOTO
470             BEQ GOTO RT
480             CMP #$8A        ,RUN
490             BNE NEXT1
500             JMP RUN RT
510   NEXT1     CMP #$8D        ,GOSUB
520             BEQ GOSUB RT
530             CMP '           ,SPECIAL
540             BEQ SPEC RT
550
560             CMP 'C
570             BNE NORMAL
580             JSR CHARGET
590             CMP 'O
600             BNE NORMAL
610             JSR CHARGET
620             CMP 'L
630             BNE NORMAL
640             JSR CHARGET
650             CMP #$BO        ,OR TOKEN
660             BEQ COLOR RT
670             ,
680             ,
690             DO NORMAL ROM-ROUTINE
700             ,
710   NORMAL    JMP $A7ED
720             -
730             ,
740             ,EXECUTE 'COLOR' COMMAND
750             ,
760             ,GET INK PARAMETER
770             ,
780   COLOR RT  JSR CHARGET
790             JSR $AD8A
800             JSR $B7F7
810             ,
820             ,CHANGE INK COLOUR
830             ,
840             STY 646
850             ,
860             ,GET PAPER PARAMETER
870             ,
880             JSR CHARGET
890             JSR $AD8A
900             JSR $B7F7
910             ,
920             ,CHANGE PAPER COLOUR
930             ,
940             STY 53281
950             ,
960             ,GET BORDER PARAMETER
970             ,
980             JSR CHARGET
990             JSR $AD8A
1000            JSR $B7F7
1010
1020            ,CHANGE BORDER COLOUR
1030
1040            STY 53280
1050
1060            ,JUMP TO REST OF ROM-ROUTINE
1070            ,
1080            RTS
1090
1100
1110            ,EXECUTE 'GOTO' COMMAND
1120
1130  GOTO RT   JSR CHARGET
1140  GOTO RT1  JSR $AD8A
1150            JSR $B7F7
1160            JSR $A9A3
1170            RTS
1180
1190            -
1200            EXECUTE 'GOSUB' COMMAND
1210            ,
1220  GOSUB RT  JSR CHARGET
1230            LDA #$03
1240            JSR $A3FB
1250            LDA $7B
1260            PHA
1270            LDA $7A
1280            PHA
```

```
1490            LDA $3A
1500            PHA
1510            LDA $39
1520            PHA
1530            LDA #$8D
1540            PHA
1550            JSR GOTO RT1
1560            JMP $A7AE
1570
1580            -
1590            ,
1600            IGNORE LABELS
1610            ,
1620            SPEC RT    JSR CHARGET
1630                       BNE SPEC RT
1640            ,
1650                       RTS
1660            ,
1670            ,MODIFIED  RUN  ROUTINE
1680            ,
1690            ,D1  RUN'
1700            ,
1710            RUN RT     LDA #0
1720                       JSR $FF90
1730                       JSR $A659
1740            -
1750            ,GO THROUGH PRG & ASSEMBLE LABELS
1760            ,
1770                       LDA # $0801
1780                       STA <254
1790                       LDA #>$0801
1800                       STA >254
1810            ,
1820            SEARCHLP   LDY #0      ,END OF PRG?
1830                       LDA (254),Y
1840                       BNE SEARCHLP1
1850                       INY
1860                       LDA (254),Y
1870                       BEQ EXIT
1880            SEARCHLP1  LDY #4
1890                       LDA (254),Y
1900                       CMP
1910                       BEQ LABLFOUND
1920            SEARCHLP2  LDY #0          NEXT LINE
1930                       LDA (254),Y
1940                       PHA
1950                       INY
1960                       LDA (254),Y
1970                       STA >254
1980                       PLA
1990                       STA <254
2000                       JMP SEARCHLP
2010            ,
2020            ,
2030            ALL DONE   RESET CHARACTER
2040            POINTER AND START PROGRAM
2050            ,
2060            EXIT       JSR $A68E
2070                       JMP $A7EA
2080            ,
2090            ,
2100            -
2110            ,STORE LABEL IN VARIABLES AREA
2120            ,
2130            ,POINT TO BEGINNING OF LABEL
2140            ,
2150            LABLFOUND  LDA 254
2160                       STA $7A
2170                       LDA 255
2180                       STA $7B
2190                       CLC
2200                       LDA $7A
2210                       ADC #5
2220                       STA $7A
2230                       LDA $7B
2240                       ADC #0
2250                       STA $7B
2260            ,STORE LABEL
2270            ,
2280                       JSR $BC3E
2290                       STA $49
2300                       STY $4A
2310            -
2320            GET LINE NUMBER
2330            -
2340                       LDY #4
2350                       LDA (2[illegible]
2360                       STA $[illegible]
2370                       INY
2380                       LDA (2[illegible]
2390                       STA $[illegible]
2400            ADD PT TO END OF PRG AREA
2410            -
2420                       CLC [illegible]
2430            -
2440                       JSR $BBD0
2450            ,
2460            ,[illegible] TO VARIABLE TYPE
2470            -
2480                       JSR $BBD0
2490            ,
2500            FINISHED
2510            ,
2520                       JMP SEARCHLP2
2530            ,
2540            -
2550            ,TEST FOR REST OF 'OFF'
2560            ,
2570            OFF RT     JSR CHARGET
2580                       CMP 'F
2590                       BNE NORMAL1
2600                       JSR CHARGET
2610                       CMP  F
2620                       BNE NORMAL1
2630            ,
2640            ,EXECUTE   OFF  COMMAND
2650            ,
2660                       JSR EXTBASOFF
2670            ,
2680            ,GET NEAT CHARACTER AND
2690            ,JUMP TO REST OF ROM ROUTINE
2700            ,
2710                       JSR CHARGET
2720                       RTS
2730            -
2740            .
2750            ,
2760            NORMAL1    JMP $A7ED
```

Listing 2

```
110  BEGINNING
120 INK=INT(RND(1)*16)
130 PRINT  INK=  INK
140 PAPER INT(RND(1)*16)
150 PRINT TAB(15)  PAPER=  PAPER,
160 BRD INT(RND(1)*16
170  PRINT TAB(28)  BORDER   BRD
180 COLOR INK PAPER BRD
190 GOSUB DELAY
200  GOTO BEGINNING
210  DELAY
220 FOR N 1 TO 500
230 NE T
240 RETURN
```

Tech Troubles

A selection of the problems solved and readers' hints from this month's mailbag

By Andy Andros

Why do computers use integers as well as normal decimal values, and where do floating point numbers come into it?
David Kennedy, Easingwold

Dear David,
Another term for an integer is a 'whole number' or, as you point out, a number without any decimal point. Other numbers are referred to as 'floating point' numbers because of the way in which the mathematics is performed in the computer's memory. Floating point calculations are difficult to explain in the space allowed here but luckily, the fact that they *do* work is all that you really need to know for Basic.

The reason that computers use integers is because it helps to speed up arithmetic, and is more accurate than floating points where a certain amount of rounding up and down of values occurs. The speed benefit is gained because there is no need to calculate the position of the decimal place or to check if the value should be expressed in exponential form where an extremely large or small number is expressed by a value and the power to which it has to be raised to reveal the actual number.

A popular myth is that integers use less memory than floating point values but this is not entirely true. Integers use four bytes – two for the variable name and two for the actual number. Floating point numbers similarly use two bytes for the variable name, but five more bytes are needed for the value. So on the face of it,

integers do need less space but the integer value is followed by three unused bytes, which means that both types of variable physically occupy seven bytes of memory

I bought the Your Commodore Serious Users Guide 1988, and found the 64 tips for the 64 quite informative. One of the tips is how to simulate a PRINT AT command without using rows of cursor downs and lefts. I thought that you may be interested in a technique that I've been using for the past few years

```
10 POKE214,9:PRINT"[UP]
20 POKE211,15
30 PRINT"HELLO
```

Location 214 is the vertical position of the cursor on the screen (value 1 to 24). The PRINT command in line 10 is used to update this new row in the Commodore's memory, and a cursor up to replace the cursor onto the required line. Next the cursor is placed horizontally by poking a value to location 211 and the message can then be printed

Two final words on this routine relate to printing on the top and bottom lines. For using the top line, printing a cursor home with a semicolon will set the row position and then the column value can be poked into 211. If the last line is used the screen will scroll up unless you follow the message printing command with a semicolon.

I hope this is of use to someone, somewhere

Carol Seddon, Wigan

Dear Carol
Thanks very much for that tip. I found it very informative, and if anyone else has a technical tip I'd be very pleased to hear about it

In a listing I came across the following syntax which I don't understand

```
230 HEX$=CHR$ A+48 (A>9)*7)
```

Could you explain what it achieves?

Clive Fowler, Midhurst

Dear Clive
This is an unusual but useful application of a comparison command. It is the sort of routine which would convert a decimal value to its hexadecimal equivalent.

To understand how it works, I'll have to explain the principle behind the *greater than* and *less than* commands. When a comparison is made, the result is a zero if the condition is false and a minus one if the condition is true.

In the example that you've supplied, the value given by the comparison would be zero if X had a value between zero and nine but minus one if the value exceeds nine. What the equation is doing is taking the value in A and adding 48 to give a value whose CHR$ equivalent is the number character which corresponds to X. This works well up to a value of nine, but values 10 to 15 would produce punctuation marks and symbols because there is a gap of seven characters between the CHR$ value for nine and the CHR$ value for the letter A. The program has to be able to add seven to values over 10 but not to values below that.

The solution is to compare the value with nine, and then multiply this by seven. This would mean that the low values would subtract zero from the CHR$ value but high values would subtract 7 (-1 multiplied by 7). Subtracting a negative value follows the mathematical law that states that two minuses gives a plus, so the program actually adds seven to the CHR$ value.

To test this try setting up a loop for A having values of zero to 15. Place the equation inside the loop and a statement to print each HEX$ value, and the result will be a list of hex equivalents from 0 to F.

I have written a program which uses several groups of DATA statements but the only problem with it is that RESTORE can't be set to point to a particular line. Is there any easy way around this, because at the moment I have to RESTORE and then read in DATA until the correct point is reached?

Harry Ivy, Hampton

Dear Harry
There are two ways to tackle your problem. The first is to read the data into several arrays and manipulate these instead of using data READs.

The second method is to create a special form of the RESTORE command. This is done by reading in the data until the line where the program is to be restored to. The actual memory location can be stored by peeking locations 65 and 66 and storing this in a table in a safe part of memory.

Each suitable point is similarly stored until the table is complete. When the data reading has to be restored to any of these points, they can be peeked from their storage point and poked back to 65 and 66.

Can you tell me where I can find a good book containing a breakdown of the C128 Basic ROMs? I have a hunch that such a book may not exist, because I have a book which gives a breakdown of the Kernal, but which states that the Basic disassembly would fill a very large volume

Richard Trey, York

Dear Richard,
You'll be pleased to hear that such a book does actually exist, though you are right in assuming that it is a weighty tome. *C128 Basic 7.0 Internals*, published by Abacus, runs to over 600 pages. Of this 450 pages contain an annotated ROM disassembly, and the rest is packed with useful information about the workings of the system, alongside some useful programming hints and routines. The price is £16.95, and it is available from Precision Software, 6 Park Terrace, Worcester Park, Surrey KT4 7JZ, but please include £1.40 for post and packing.

If you have a problem let us know and Andy will try to help. Write to: Tech Troubles, *Your Commodore*, Argus House, Boundary Way, Hemel Hempstead, Herts HP2 7ST.

THE EPSON SQ-2500

To conclude last month's feature on the world of 24 pin dot matrix printers, Robin Burton admires the highly impressive Epson SQ-2500

The first major task is getting the SQ-2500 out of the box Ideally, it's a job for two people The SQ-2500 might be expensive, but it has a wide carriage and you certainly get a lot of printer for your money Styling is recognisably Epson, but the greatest impression from the first is that this printer oozes quality Construction is superb I didn't actually try it, but I'm sure I could jump on the SQ-2500 without damaging it (and I weigh over 16 stones)

Setting it up

This is an ink-jet printer so there's no ribbon, just an ink cartridge, paper feed knob, the mains lead and paper guide Open a cover on the right side towards the rear of the printer push in the ink cartridge, close the cover and that's done On the left side is a similar cover, but unless you want to use either of the possible two extra font cartridges, you needn't open it

The interface and power lead connect at the rear, as usual for Epson, and the power switch is on the right side The paper guide easily slots into position, and when an new ink cartridge is fitted, the SQ needs priming (this is the long cleaning cycle mentioned later, but it just means switch on and press a button) After about half a minute it's ready to go

Both parallel and a serial interface are standard, with provision for a third one, and any of the extra Epson interfaces (listed in the LQ-500 report) can be used too The standard buffer is 8K The manual is 170 pages, in contrast to the LQ's 240, but contains all the necessary ingredients, including both types of command summary and a quick reference card

If you can afford an SQ buy one! If you do, don't waste time looking for dip-switches there aren't any! Four buttons (and one of those is on/off line) control EVERYTHING!! This explains the short manual There's very little on trouble shooting The only way I can envisage anyone having trouble with the SQ is if they can't read, in which case the manual wouldn't help much

I'm not being flippant! It's all set-up, and manual selection is by question and answer, but with a difference There's a liquid crystal display at the front of the printer next to the selection buttons, and the SQ asks the questions You answer by simply pressing a button and the settings are stored This is a dream machine

Superb though this is there's more! The SQ also has four macros Each of these is a complete, permanently stored definition containing everything you could want the printer to know about a job Any one of the four can be loaded automatically at power up you choose which one you want in the configuration defaults, which remain permanently set unless you alter them

You can manually load any macro by a couple of button presses, and can also amend them manually, by software or both, either temporarily, or permanently Simply re-save a macro at any time (by pressing a button) if you want the changes to be permanent If not they're forgotten either when you switch off or when you load a different macro You might also want to print out the settings, in which case – press a button

This is all so comprehensive yet simple that describing it is difficult I've therefore included a print of my configuration settings separately, so you can see for yourself Everything is stored left and right margins, font, style, pitch page size, etc etc

As standard, the SQ-2500 is a cut sheet machine, but an optional tractor unit can be added for continuous paper You may have gathered by now that the SQ-2500 is intended for high quality high speed, high volume output The fact that the tractor is top-mounted and therefore without paper parking is in context, irrelevant

Don't misunderstand swapping between continuous and sheet-feed is easy enough, but if you need to do it very often you don't need an SQ-2500 It wasn't built for the average home user's mixed low volume needs, and used that way would be like doing the grocery shopping in a Formula One car theoretically possible but...

If cut sheet is the major use a double bin automatic sheet feeder can also be attached

Specification

The SQ-2500 is of course above all an Epson so the compatibility comments for the LQ-500 all apply to the SQ including the 13 national character sets

Six fonts are standard for the SQ 2500 each as usual with italic Additional effects are limited to double width, double height or both All fonts are available in the usual 10 12 and 15 cpi, and all can be condensed except 15 pitch

There's also provision for two font modules, but so far as I could see all the Epson LQ fonts are standard in the SQ except OCR-B Minimum vertical spacing is in 180ths of an inch, and horizontal is in 360ths

Using the Epson

When the SQ powers up it automatically goes through a self-cleaning cycle The printer informs you (via the LCD) when the ink cartridge is getting low, and when it's exhausted According to the manual, a cartridge lasts for 3,000,000 characters in LQ, and 6,000,000 in draft. This seems fair enough I've gone through well over 1,500 sheets largely in LQ (roughly 6,000,000 characters) and not a word so far

Using semi automatic sheet feed is simple and quick, and it has been absolutely reliable with all weights of paper Just drop a sheet into the guide press 'form feed' and the sheet is lined up perfectly (I even tried it with a 9 x 4 inch envelope notoriously difficult to keep straight – with no trouble at all)

If the tractor is fitted, it simply attaches on top of the SQ there are no covers to change Usefully, along with the tractor, Epson provide a matching base on which the printer sits Continuous paper is kept inside this, out of the way A paper rest is also included to keep the paper clear of the leads

Manual line feed form feed, self-test and hex dump are controlled by the buttons, and the self test includes the current configuration and macro settings too As mentioned before, just the configuration and the four macros can also be listed on demand (or alternatively checked directly via the LCD) Without altering any of the current settings you also can switch between draft or LQ at any time by pressing either the line feed or the form-feed button

Print quality is frankly so superior to that of an impact dot-matrix printer that a comparison is pointless Because there are no wires pressing through a fabric ribbon, the individual dots are much smaller and more precise I've even asked when I bought a laser-printer by people who didn't know I had the SQ It might not be quite that good, but it's obviously near enough and you'd have to put the two side by side to notice a difference Also unlike any impact printer, the quality never varies There's no deterioration or fading of print quality, because there's no ribbon to wear out Characters are always perfect and uniformly sooty black

The SQ is the fastest matrix printer I've ever seen The figures don't adequately tell the story you have to see it to appreciate just how quick it is In fact its speed was at one point an inconvenience With such dense character images, double strike is almost unnecessary Of course I tried it, but output was quick enough to allow the paper to re-fold in the collection basket before the ink had fully dried I have now lowered the basket

The final difference about the SQ is noise, specifically the absence of it only ink touches the paper You don't realise just how much you are mentally conditioned to brace yourself for the onslaught of noise from an impact printer at least not until you start printing and it doesn't happen It's rather uncanny at first, and after years of impact printers, it took me a week to get used to this Needless to say the SQ easily passes the telephone test, in fact if you were surrounded by them it would be no problem

Quite aside from its obvious desirability, this aspect of the SQ's performance (along with the others) offers very serious benefits for offices where several printers are at work I would think the amount of noise from the SQ (just the carriage moving back and forth) would be acceptable even in places like libraries and hospitals too

The SQ-2500 has operated perfectly throughout

Conclusion

It hardly needs saying that the SQ-2500 is Epson's top-of-the range conventional dot matrix printer, and it has been for a few years now It is built like the Forth Bridge, and has by far the easiest manual control of all operational features of any printer I know Macros are excellent, and allow an automated switch between four completely different set-up definitions in literally a couple of seconds.

Of course the recent arrival of low-cost laser printers must have eroded SQ sales, but there are still plenty of jobs that laser printers don't do very well or at all, (like printing A3 pages sideways) and their running costs are also higher than the SQ's One laser printer limitation however is shared by the SQ-2500 Because it's not an impact device multi-part sets are impossible, though with its speed you'd probably just print extra copies as needed.

In its target market, I doubt that the SQ-2500 has any competition. Quality is beyond question in construction, operation and output It must be the fastest, quietest way of getting high quality print onto paper, with all the flexibility of a conventional printer and a virtual absence of operator skill or training

The recommended retail price is £1,349 Options include a tractor unit at £90 and a double bin automatic sheet feeder at £370 (£1,551 35 £103 50 and £425 50 including VAT) Ink cartridges are about £24 and have a shelf life of two years

Checking current advertisements I found that the SQ-2500 can be purchased for around £975 plus VAT, with proportional reductions in the optional fittings

TABULATION FOR YOUR COMMODORE/MAY/PRINTERS

	Dimensions WxDxH	Time/Speed to print 5000 chars Draft	Letter	Weight
Star LC24-10	17"x13"x4 5"	56 secs/89 cps	137secs 36 cps	14 5 Lbs
Epson LQ-500	16 5"x12"x6"	52 sec, 94 cps	125secs 40 cps	15 5 Lbs
Citizen HQP=45	24"x5"x4 75"	45 secs/111 cps	100 secs/50 cps	16 5 Lbs
Epson SQ-2500	23 5x15x6	32 secs/156 cps	56 secs/89 cps	25 Lbs

Sketchpad 128

Gordon Davis examines a new version of an old favourite graphics package for the C128 computer

Sketchpad 128 is a new version of one of the first graphics packages for the C128 computer to be released. Originally it was only available as an add-on to the Graphics Programmer's Toolkit, but now it is available as a stand-alone package.

The package has been written by Jeremy Vickerstaff of Walker 64 Basic fame, a language which, as mentioned earlier, gives a complete set of graphics commands to the system. Sketchpad 128 is no exception. Basic is the language for this package and the commands are exactly those which are found in Basic 8 except for some subtle differences.

A C64 version (not 128 mode) is also available for Sketchpad. Basic 8 does not include many of the commands found in Basic 7.0 and therefore Sketchpad 128 does not support them either. Also, it does not support the use of the function keys as shortcuts to commands.

Little missing

Fortunately, we managed to find the Basic 128 version, a disk-based package. There's very little missing except for some Turbo Basic commands that allow the reboot of Basic 8 and the screen.

The manual, which is of a very good, if a little cramped, standard, has been written by someone familiar with Apple Macintosh programs. The menu system looks very Macintosh. All commands are used from the drawing screen by clicking the left mouse button. The graphics cursor is moved around by pressing the keys on the numeric keypad.

The rest of menu is the only thing we regret it has taken over two years to get familiar with the menus of programs. Needless to say, you can't use Basic 7.0 commands with a memory configuration of 64K. The Basic 8 commands will work in any mode. The annoying thing of all this is that the software was written for 64K, which is something that you are not very well with the package.

Sketchpad supports the printer, the 1351 mouse, the Koala Pad and the Light Pen. There is also support for the Commodore 1700/1750 RAM expansion unit. A useful feature is the ability to load a Koala Painter picture and then edit it. Unfortunately, you can't save Koala Painter pictures with Sketchpad 128 which is also true of the Graphics Programmer's Toolkit.

The manual says that you can't use the Sketchpad commands from within a program, but you can. You can also use the Basic 8 commands to load and save pictures. The manual is far from complete and does not explain how to use the Basic 8 commands.

[illegible]

Solid graphics

[illegible]

[illegible]

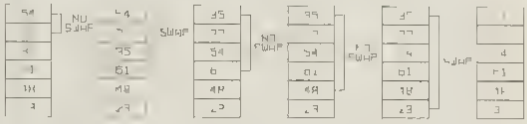
Routine Programming

A bubbly routine to sort lists into orderly sequences

By Eric Doyle

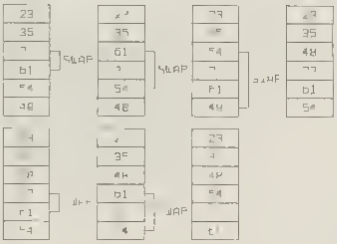
Programs often include lists of numbers or strings which have to be displayed in an orderly way. This could be alphabetically or numerically. This bubble sort subroutine can be used, suitably modified, for either purpose.

Bubble sorts work by comparing neighbouring list items and swapping them over if one exceeds the other. Take this list as an example:

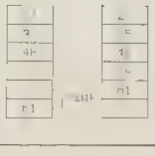


The first number is compared to the rest of the numbers in the list one at a time. If the number under comparison is smaller than the first number, a straight swap takes place. In this way the smallest value rises to the top.

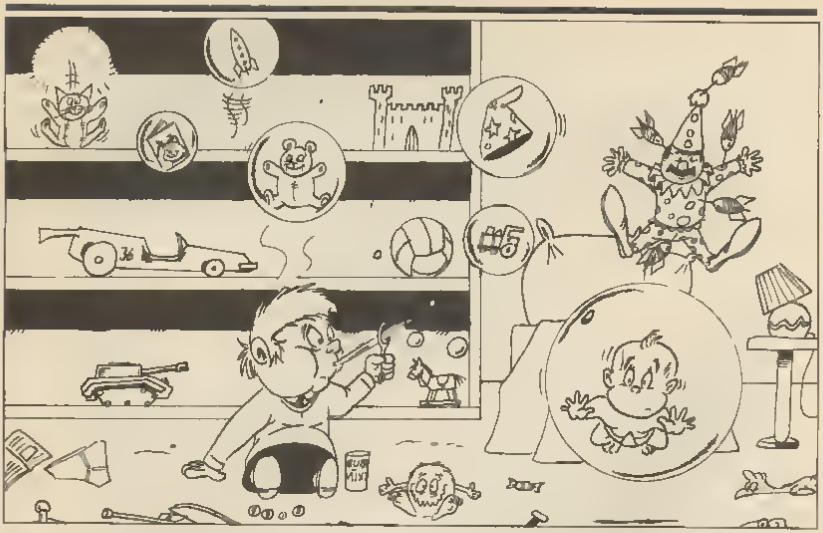
After this process is completed, the second number is compared to all of the following figures in a similar way.



This is repeated, gradually passing down the column until the last two characters are compared and swapped if necessary, and the sort is then complete.



The two elements of the sort are a loop which selects the character to be tested, and a loop within this, a nested loop which selects the remaining characters in the list for comparison.



```
60200 FORZ1=1TOZ-1
60210 Z2=Z1+1
60220 FORZ3=Z2TOZ
```

The value Z is the number of items in the list. Line 60200 forms the main loop for the character to be tested. It only runs from the first to the master penultimate character because there would be no point in comparing the final character with itself.

Line 60210 calculates the first character to be tested by the nested loop which is initiated in line 60220. Line 60230 tests the two values, and if they are already in the correct order no action is taken and the exchange routine is bypassed.

```
60230 IFZ(Z1)<Z(Z3 THENGO270
```

If an exchange is necessary this is done by using a temporary store for one of the values, so that values can be swapped with ease.

```
60240 Z(0)=Z(Z1)
60250 Z(Z1)=Z(Z3)
60260 Z(Z3)=Z(0)
```

Z(0) takes the value held in Z(Z1) and Z(Z1) can then be given the value held in Z(Z3). The stored value can then be moved from Z(0) to Z(Z3), and Z(0) may then be discarded.

Now that everything has been done the loops can be closed and eventually control is handed back to the program with a RETURN command.

```
60270 NEXTZ3,Z1
60280 RETURN
```

The listings shown contain an example of numerical sorting using this subroutine and there is also an alphabetical sort routine which shows how this routine has to be modified for this use. Really all that has happened is that the Z(x) values are changed to Z$(x).

Parameters for Main Program

Sending

Z — Number of list items
Z(x) — List item values

Returns

Z(x) — The sorted list

Other Variables Used

Z1 — Main loop variable
Z2 — Remainder of list items
Z3 — Nested loop variable

```
 PROGRAM  NUMBER SORT

33  10 A=1 AA=50 DIMZ AA) ZZ AA(
09  20 R =RND 1 *AA 1
E9  30 Z(A)=F  A=A+1 IFA<AA+1THE
    NZ0
5A  40 FORA=1TOAA PRINTZ A)  NEY
    T PRINT
BE  50 Z=A 1 PRINT SORTING
32  60 GOSUB1000
```

```
DF  70 FORA=1TOAA PRINTZ(A)  NEX
    T
DO  80 END
3A  1000 FORZ1=1TOZ-1
77  1010 Z2=Z1+1
B7  1020 FORZ3=Z2TOZ
75  1030 IFZ(Z1)<Z(Z3)THEN1070
71  1040 Z(0)=Z(Z1)
22  1050 Z(Z1)=Z(Z3)
F7  1060 Z(Z3)=Z(0)
70  1070 NEXTZ3 Z1
32  1080 RETURN
```

```
 PROGRAM  NAME SORT

53   1 Z$ 1 = "ENP"
77   2 Z$(2)= "JEPHN
94   3 Z$ 3)= "JOHN
AF   4 Z$ 4 = "ALBERT
10   5 Z$ 5 = "JOE
10   6 Z$(6 = "WILLIAM
2L   7 Z$(7 = "ST ART
EE   8 Z$ 8 = "CHRIS
50   9 Z$(9 = "CHRISTOPHER
OL   40 FORA=1TO9 PRINTZ$(A)
     NE T PRINT PRINT
37   50 Z=A 1
```

```
32   60 GOSUB1000
53   70 FORA=1TO5 PRINTZ$ A)
     NEXT
DO   80 END
3A   1000 FORZ1=1TOZ 1
77   1010 Z2=Z1+1
B7   1020 FORZ3=Z2TOZ
61   1030 IFZ$(Z1)<Z$(Z3 THEN1070
6D   1040 Z$(0)=Z$(Z1)
A0   1050 Z$(Z1)=Z$(Z3)
E5   1060 Z$ Z3)=Z$(0)
70   1070 NEXTZ3 Z1
B2   1080 RETURN
```

Software for Sale

If you think that one of our programs looks very interesting, but you can't afford the time to type it in, then our software service will help you out

It's three o'clock in the morning. You sit at the computer keyboard having just finished a marathon typing session entering one of the superb programs from *Your Commodore*. Your fingers reach for the keyboard and press the letters R, U and N. You press RETURN, sit back and nothing happens.

Everyone has probably faced this problem. When it does happen it's a matter of spending hours searching through the program for any typing mistakes. No matter how long you look or how many people help you, you can usually guarantee that at least one little but slips through unnoticed.

The *Your Commodore* Software Service makes available all of the programs from each issue on both cassette and disk at a price of £6.00 for disk and £4.00 for cassette. None of the documentation for the programs is supplied with the software since it is all available in the relevant magazine. Should you not have the magazine then back issues are available from the following address:

INFONET LTD, 5 River Park Estate, Berkahmsted, Herts HP4 1HL
Tel: (04427) 76661

Please contact this address for prices and availability.

The Disk

Programs on the disk will also be supplied as totally working versions, i.e. when possible we will not use Basic Loaders thus making use of the programs much easier. Unfortunately at the moment we cannot duplicate C16 and Plus 4 cassettes. However programs for these machines will be available on the disk.

What programs are available?

At the top of each article you will find a strap containing the article type, C64 Program etc. So that you can see which programs are available on which format, you will also find a couple of symbols after this strap. The symbols have the following meaning:

This symbol means that the program is available on cassette.

These programs are available on disk.

Please Note

Since the programs supplied on cassette are total working versions of the program, we do not put disk only programs on tape. There is no sense in placing a program that expects to be reading from disk on to tape.

JANUARY 1989

PREFAB SPRITES A powerful sprite editor for the C64.
DAZPRO – A simple but helpful text processor for the C64. Available on disk and cassette but will only store files on tape.
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MARCH 1989

PERSONAL FILE A cross between a wordprocessor and a database that allows you to set up "cards" that can be quickly altered (C64 Disk only)
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B A E A K

Readers Problems

Though the Commodore 64 is one of the world's most popular microcomputers, it can be very difficult to find specific information about your particular machine

At the *Your Commodore* office we receive literally hundreds of letters from you, our readers, on a wide range of subjects ranging from the simple 'Can you give me the telephone number for ' to the more complex 'I'm trying to write a program that uses a split screen How do I do it?'

Unfortunately the volume of mail received has become so great that it is impossible to answer every letter and still manage to publish a magazine each month

For this reason we have felt it necessary to produce a number of guidelines for getting information from us

1) We cannot guarantee to answer every letter sent to the magazine Should it become apparent that a number of readers are suffering from the same problem then we will reply to the letter via the Letters page
2) A new helpline has been set up This will be open for your queries on Tuesday and Thursday afternoons between 2 00pm and 4 00pm We will not be able to deal with our telephone queries at any other time If our technical adviser is not available when you ring, then a message will be taken
3) If you are having problems with one of our listings, can you please let us know in writing This will enable us to see if a number of people are having the same problem When a common problem becomes apparent with a program, then a correction sheet will be issued Enclose a self-addressed, stamped envelope and we will send you a copy of the correction sheet as soon as it is available

We are sorry that it has become necessary to instigate these rules However, we are sure that you will agree with us that the more time that we can spend making *Your Commodore* the most informative magazine around the better

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CORRECTIONS FOR MARCH '89

HEAD FOR HOME

Once again those indestructible gremlins have caused havoc

The program as it stands will not run correctly This is due to the fact that quite a bit of code is missing from the loader program An amendment is on its way The update will be published as soon as it reaches our office We apologise for any inconvenience to our Plus 4 readers

CORRECTIONS FOR APRIL '89

BALANCE SHEET

Unfortunately there appeared a couple of errors in the Balance Sheet program from the April Edition

1) Page 331, right hand column, paragraph 4 should read Load "LIST4" and not Load 'LIST1"
2) The second line of Listing 1 should be POKE770 131 POKE771 164
3) All the REM statements should be taken out of Listing 1
4) Again on page 31 right hand column, paragraph 1 This should read
50 SYS57812"@ SHEET' 8,1

Commodore Where Are You?

At the *Your Commodore* office we are repeatedly asked for the address and telephone number of Commodore U K Many people, after referring to their computer manuals, believe them to be based in Corby

The Commodore plant at Corby was closed down some time ago Reproduced here you will find the correct address for Commodore U K

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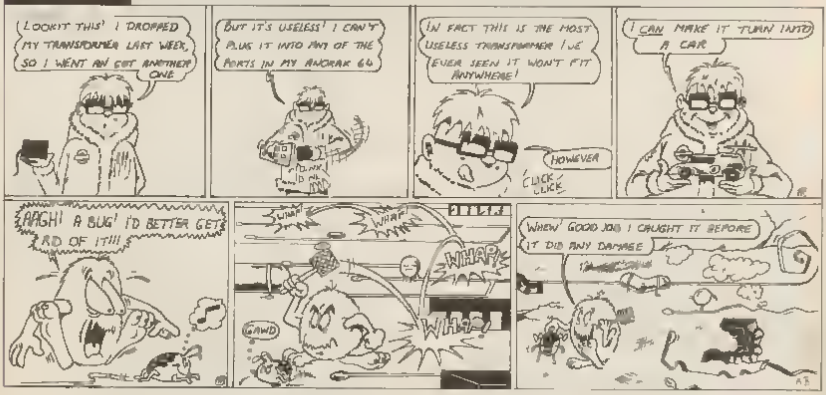


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